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THE LIFE-HISTORY OF THE SPINED RUSTIC, *BARATHRA CURIALIS*, SMITH.

BY JAMES FLETCHER AND ARTHUR GIBSON, OTTAWA.

In the Report of the Entomologist and Botanist to the Dominion Experimental Farms for 1905, at pages 179 and 180, considerable space is given to a discussion of an outbreak of a large noctuid caterpillar, which appeared in considerable numbers in Canada during 1905. Complaints of injury by this insect were received from a wide area, extending from Nova Scotia as far west as Lake Superior. During July many kinds of plants in gardens were attacked by smooth cutworm-like caterpillars, which when small were greenish in colour, having the body divided into two equal areas above and below the spiracles by a wide black stigmatal band. In later stages of growth the upper of these areas is much darker by reason of some black velvety patches above the lateral stripes, on the dorsal area, and the under side of the body becomes pale and of a yellowish hue. These caterpillars were largely nocturnal and solitary in habit, and presented a handsome appearance, with the same velvety patches so conspicuous on *Peridroma astricta* and *P. occulta*, with three lines down the back, and having each segment ornamented with two large velvety black patches. There is great variation in the ground colour, some larvæ appearing to be almost black, while others have a dark olive-green aspect, but all specimens show a distinct stigmatal band, along the side just below the spiracles, which is yellow in colour, marked centrally with red.

In the above-mentioned report this insect was treated of under the name of *Barathra occidentata*, Grote, but we have since learned from Sir George Hampson, of the British Museum, that the species is really *B. curialis*, Smith, and this identification has been confirmed by Dr. J. B. Smith and Dr. H. G. Dyar. In the past this insect has been extremely rare in Canada, the only abundant occurrence which has taken place during the last thirty years being in 1905, and although the larvæ were very abundant that year, very few of the moths were taken during the past season. No parasites were bred from material collected in the field in 1905.

We were fortunate enough to secure a batch of eggs from a confined female, and the following notes were taken upon the preparatory stages:

Egg.—Dome-shaped; tapering slightly to the base; diameter, 0.6 mm.; height, 0.4 mm., with about 44 ribs. In confinement the eggs were laid in a large flat patch in close, even, rows of from ten to twenty eggs in a row. Over 700 eggs were laid by a single female. Eggs hatched on July 5 and 6.

Stage I.—Length 2.5 mm. Body cylindrical, after feeding pale greenish; skin smooth and shiny. Head 0.3 mm. wide; rounded, deeply emarginate at vertex, shining, blackish-brown. Thoracic shield, piliferous tubercles and anal shield all shiny black. No markings on body.

Stage II.—Length 5.5 mm. Body pale green. Head 0.6 mm. wide, pale brownish, with darker brown around each hair. Thoracic shield concolorous with body. Dorsal stripe whitish; lateral stripe irregular and rather wavy; stigmatal band whitish, faint. Tubercles black, conspicuous, shining, each with a stiff black bristle. Feet concolorous with body.

On July 10 a few specimens moulted the second time, many others soon afterwards.

Stage III.—Length 8 mm. Head 0.9 mm. wide, greenish-brown, distinctly marked with large black spots, which are of about the same size as, and appear as a continuation of, the tubercles on the body. In addition there are numerous dark dots over the whole head; ocelli black. Body above spiracles darker than in Stage II, and of almost the same colour as the upper surface of a clover leaf upon which they were feeding. Below stigmatal band the colour of the body is pale green. Dorsal stripe white, distinct on all segments; lateral stripe white, but uneven and broken in places; stigmatal band whitish, not distinct. Tubercles black, setæ now pale. Tubercles above spiracles surrounded with white. Spiracles black. Thoracic feet rather translucent, prolegs concolorous with venter.

On July 12 and 13 a large number of the larvæ passed the third moult.

Stage IV.—Length 13 mm. Head 1.4 to 1.6 mm. wide, of the same appearance as in Stage III. Body dark green above spiracles, paler on ventral area; some specimens darker green than others, and one with a decided brownish tinge; whole dorsum now marked with dots and short streaks of white; colour of all specimens in the incisures whitish or pale yellowish. Dorsal stripe not so even as in last stage; lateral stripe as before; stigmatal band wide, whitish, paler below the spiracles, and suffused with green, some specimens bordered above the band with dark green. Spiracles pale, rimmed with black. Feet concolorous with body; thoracic feet rather translucent and shiny.

On July 14 many specimens moulted for the fourth time.

Stage V.—Length 18 mm. The larvæ in this stage are not constant in general appearance as heretofore, but vary considerably in colour, being pale green, brownish green, or decidedly pale brownish. Head 2.0 to 2.2 mm. wide, in the light coloured larvæ pale, almost concolorous with the body, and without any spots, but in the darker larvæ distinctly mottled and marked with dark brown, particularly on the inside upper portion of cheeks. The green larvæ are almost exactly the same as in Stage IV, but the brownish larvæ are different. In these specimens the dorsal stripe is broken, and is bordered on either side with dark brown, and in the incisures, especially those of the central segments, the colour is decidedly yellowish. Sublateral area rather heavily dotted with black or dark brown, giving a blackish appearance to this area just above the spiracles. The stigmatal band in some of the green larvæ is now inconspicuous, the upper margin showing simply as a white line connecting the spiracles. In the darker specimens it is much the same, but more conspicuous on account of the dark colour above the spiracles, and the space occupied in previous stages by the stigmatal band being flushed slightly with red. Spiracles white, elongated, rimmed with black. Ventral surface of all specimens pale green, marked with small white spots and streaks. Feet pale.

On July 19 some of the larvæ again moulted.

Stage VI.—Length 27 mm., cylindrical. Head 3.0 to 3.2 mm. wide, rounded, honey-yellow, coarsely mottled with dark brown; frontal field and clypeus dark brown, not mottled; clypeus large, margined with white, and running three-quarters up the face to the base of the vertical groove; mandibles tipped with black. Ground colour of body in varying shades of gray or drab; all larvæ dark, none green. A few specimens are of a rather ruddy brown hue. The dorsal and lateral stripes are clearly defined, but less conspicuous than before. Somewhat triangular-shaped black velvety patches lie above the lateral stripes and run out to the dorsal stripe, where they sometimes almost meet on the anterior portion of the segments. These are more conspicuous on the posterior segments, but on some specimens hardly show at all. Above each spiracle there is also a conspicuous black velvety field clearly defined below, which renders the upper margin of the stigmatal band very distinct. The stigmatal band itself is pale yellow, and much flushed with red, particularly below the spiracles. Spiracles white. Ventral surface pale green, the darker specimens sometimes streaked and mottled with black on the substigmatal area. The ruddy specimens similarly show a red mottling. Piliferous

tubercles inconspicuous in most specimens. Thoracic and anal shields concolorous. Feet concolorous or slightly infuscated. Length when full grown 44 to 48 mm., width 6 to 8 mm.

These larvæ were very active through all their stages, and when full-fed wandered about a good deal. On July 26 most of them were full-grown, and many buried and pupated in oval cells about four inches below the surface.

Pupa.—19–23 mm. long, 5.5–6.5 mm. wide at widest part, rather slender, abruptly pointed at anal end; dark chestnut brown, shining. Anterior third of abdominal segments deeply and coarsely punctured. Cremaster conical, black, deeply roughened and grooved longitudinally, with a pair of slender terminal rigid bristles 0.7 mm. long, separate but close together, with the tip of each expanded into a button with recurved edges.

The pupæ were kept in a cool cellar all through the winter, and were brought up to the office about the end of April. The moths emerged from May 4 to 26, three or four weeks earlier than the species was collected outside.

Food-plants.—Up to Stage IV the larvæ were fed chiefly on clover, grass and dandelion, but as they did not seem to be growing fast enough they were changed to Bleeding-heart *(Dielytra spectabilis)*, specimens having been found in considerable numbers on this plant at the Experimental Farm. Other plants which seemed to be particularly attractive to these caterpillars in a state of nature were Larkspurs, of which the seed-capsules were much injured, Spinach and Cabbage. They are, however, rather general feeders, but being nocturnal in habit, their food-plants were rather difficult to detect.

THE CLASSIFICATION OF THE CULICIDÆ.

BY S. W. WILLISTON, UNIVERSITY OF CHICAGO.

In the revision of my Manual of North American Diptera, now in press, it has been necessary for me to examine critically the recent publications on the classification of the Culicidæ. Although I have never ceased to be an interested reader of dipterological literature, I was hardly prepared for the flood that has nearly swamped me in the attempt to reach *terra firma.*

It is unfortunate that, among the score or more who have written upon the classification of this family within the past six years, nearly all have been amateurs in entomological taxonomy, some, indeed, whose only papers on entomology have been those proposing new "subfamilies." I

do not wish it to be inferred by my statement that I impugn the ability of many of these writers; far from it. The fact, nevertheless, remains, that no one is competent to discuss philosophically the classification of any group of animal life who is not well grounded in the principles of taxonomy as applied to related animals. And the ignorance of related Diptera has been, more than once, deplorably shown by writers on the Culicidæ. A writer who persistently calls the beginning of the third longitudinal vein a "supernumerary cross-vein," and the fourth posterior cell the "anal cell," without in the least attempting to show that the standard authors on Diptera have been greviously in error, is, from the very nature of the case, incompetent to discuss classificatory characters, since the mosquitoes are not organisms isolated from all other living creatures.

It may be urged, on the other hand, that not being a specialist in the Culicidæ myself, I am not competent as a critic, and that is possibly true. I have, however, studied patiently a dozen or twenty of the so-called new genera of the mosquitoes, and have a more or less critical acquaintance with at least a thousand other genera of Diptera in all families, and I humbly submit that it is not necessary, at least for one whose taste is not depraved, to devour a whole sheep in order to detect the flavor of mutton.

Until within recent years, dipterologists were content to classify the known Culicidæ in a half dozen or so genera, genera which could be defined by characters equivalent to those used for generic definition in the allied families. With the great impulse given to the study of the mosquitoes by the marvellous economic discoveries of recent years, it was only to be expected that many new forms would be brought to light, and new structural characters discovered. The Culicidæ in the past had been generally neglected by students of Diptera, for two chief reasons: the frailty of the insects themselves and the difficulty of preserving them intact, and the recognized difficulties of their study. It naturally was very desirable, with the great influx of new forms, both for scientific and economic reasons, that relationships should be more closely defined than had hitherto been done. The results so far have been that a few new genera, based upon characters equivalent to those previously used, have been established, and that the other old genera have been broken up into scores of groups, to which the designation of genus has been, correctly or incorrectly, applied.

Theobald, in his recent discussion of the genera of the world, recognizes about seventy-five genera, and has promised more. American writers, with no less modesty, have proposed a score or so additional ones.

Altogether, then, perhaps a hundred generic names have been offered for the acceptance of students of Diptera.

Coquillett, in his recent paper on the North American mosquitoes, has attempted to define forty-one genera, eighteen of which contain a single species each, and eight others but two species each. The whole number of species included in these forty-one genera is about one hundred and forty, or an average of about three and a half species to each genus. It might be added, for the encouragement of the genus maker, that there is still room for nearly one hundred genera before each of our species has a generic name all to itself—and there seem to be plenty of characters, such as they are, for the manufacture of these new "genera."

And what is the result? As has been said by others, and as I can corroborate, for the most part it is simplest to determine the species first from their descriptions, and then, of course, the generic determinations are easily ascertained by reference to the catalogues. And there has been not a little guessing done by some of the most prolific writers, as might be shown, were it worth while.

It is Theobald to whom we are indebted for the larger part of the proposed genera. He urged, and rightly, that there were too few genera, for convenience-sake. It is very true that, in some other families of Diptera, as, for example, the Tabanidæ, we are not greatly disturbed by large numbers of species in a genus, and even reject many proposed divisions that do not divide. I frankly confess that I am so old-fashioned that a genus means something more to me than an additional name for a species, and do not like to see divisions made on the score of convenience alone. Venational and plastic differences there are few among the mosquitoes; palpal and antennal characters it was thought had been used to their limit; and there seemed nothing left but the character of the vestiture. Theobald insists that he has found trustworthy generic characters in the shape and distribution of the scales of the body and wings. In a measure he may be right, but when it comes to the differentiation of genera, and even subfamilies, by the aid of a few scales alone (*e. g.*, *Phagomyia*, Theobald, "is allied to *Stegomyia*, but is separated by the narrow-curved scales on the lateral lobes of the scutellum"!) whether they are broad or narrow, curved or straight (Theobald lists seventeen kinds of scales), with their countless permutations in the different parts of the body, I protest that triviality has reached its limit. He insists that if a horse were covered with scales instead of hair it would be at once recognized as of a different genus from *Equus*. I have been a student of the vertebrates for thirty

years, and beg to express my decided dissent from such a proposition. If a horse were clothed with scales as large as saucers, with *no structural differences*, it would not be tolerated as a distinct genus. But such examples are hardly pertinent here. A graver charge is that Mr. Theobald believes that palpal characters should not be used, because of the difficulty of detection. In other words, we should not trouble ourselves about natural or genetic characters when they are difficult to observe, but use artificial ones that may be easily seen. However, he urges that the palpal characters are not as true indices of relationships as are the scale characters. This is important if true, but I am bold enough to say that it is not true. In all other families of Diptera the structure of the palpi has been found safe in classification, and it would be strange indeed if the mosquitoes should prove to be an exception. And Mr. Theobald is hardly consistent; he readily uses certain palpal characters for the definition of subfamilies, but denies to others generic value. And it must be remembered that Mr. Theobald bases his ideas of relationships almost exclusively on scale characters, and it is no wonder that he reasons in a circle. My own conclusion is that characters derived from the shape of the scales are both artificial and inconvenient, and at most only of specific value.

The proposal of a host of genera based upon such trivial characters is bad enough, but words fail me in my expression of amazement at the proposition to base a dozen or more subfamilies almost wholly upon secondary sexual and scale characters. Secondary sexual characters are looked upon universally by taxonomists as of very doubtful generic value, and very rarely have they been accepted. Here we would have them do duty as primary divisional characters in the family. Theobald naïvely says that the males of his Toxorhynchitinæ can not be distinguished from the males of his Megarhininæ, even generically. "The females of the Culicinæ and Ædomyinæ are so alike that, without the examination of the males, it is not always possible to place them in the right subfamily." Coquillett, who has tried to avoid secondary sexual characters in his definition of the subfamilies, separates, for example, his Psorophorinæ and Culicinæ, as follows:

"Femora bearing many outstanding scales; wing scales narrow..... Psorophorinæ.

"Femora devoid of outstanding scales (except in the genus *Ædomyia*, which has broad wing scales)..... Culicinæ."

Of all the writers, one would have thought that Coquillett would have recalled the fate of Brauer's numerous "families" of the Tachinidæ, and have refrained from the use of such trivial characters. Think of it, a subfamily distinguished ultimately by "broad" or "narrow" wing scales!

But this is not the worst, though bad enough. Theobald found a certain specimen with a scaled seventh wing vein, and straightway elevates it to generic and subfamily rank, the Heptaphlebomyinæ! Just imagine that character or its equivalent being used singly as a subfamily character in the allied families!

Nor is this all. Mr. Theobald has suggested, and I regret to see that Coquillett, from whose wide acquaintance with Diptera we should expect better things, adopts the suggestion, that the Corethrinæ should be separated from the Culicinæ as a distinct family of Diptera; and, ergo, the family Culicidæ be raised to superfamily rank. Because, forsooth, *Corethra*, while identical in venation, bodily structure, larval habits and structure, does not have piercing mouth organs. Imagine such a proposition coming from Loew, Schiner or Osten Sacken! Suppose we apply this criterion elsewhere in the Diptera, and witness the results. *Stomoxys* and its allies become the Stomoxiidæ (and the Muscinæ are only a subfamily at the best); *Ceratopogon* and its allies the Ceratopogonidæ (and the group is far more widely separated from the other genera of the Chironomidæ); *Phlebotomus* the Phlebotomidæ, etc. What a pretty classification we should have if we used the mouth structure alone for family divisions in the Tipulidæ, Chironomidæ, Cecidomyidæ, and the Cyrtidæ, for example. Even the Bombyliidæ, and many of the groups of the Muscidæ, would be stampeded. Coquillett, at least, knows that the three or four "new" families that have been proposed in recent years, all of them with more distinctive characters than the Corethrinæ possess, have been unanimously rejected by dipterologists. How, then, do the culicidologists expect to receive greater consideration? It would almost seem that they consider themselves as without kin to other entomologists, and that whatever they say is, *ex cathedra*, incontrovertible.

There are but two subfamilies of the Culicidæ, unless we admit the Dixinæ, which I strongly favour, the Culicinæ and Corethrinæ, and any groups of either are of lower rank, mere tribes. And we should not want a dozen subfamilies if the genera had not been so debauched.

But discussion is idle. The sanest classification so far is that of Coquillett, but that is not saying a great deal. The family yet awaits a thorough toxonomical revision. Meanwhile my advice to the general student is to ignore all those genera based upon scale characters, and call his species, as of yore, *Culex*, *Ædes*, *Anopheles*, etc.

SOME NEW GEOMETRIDÆ FROM BRITISH COLUMBIA.

BY GEO. W. TAYLOR, WELLINGTON, B. C.

The species described below were all included in a paper on B. C. Geometridæ, which was read by title before the Royal Society of Canada last May.

Unfortunately, it was not possible (owing to pressure of other work) for me to complete the paper in time for publication in this year's volume of the Transactions, and as the names have all appeared in a "Check List of the Lepidoptera of British Columbia," recently published by the Provincial Department of Agriculture, it seems better to print the descriptions now in the CANADIAN ENTOMOLOGIST than to wait the appearance of next year's volume of the Royal Society's Transactions.

1. *Eupithecia olivacea*, new species.—Expanse of largest specimen, 34 mm. Palpi short, slender, drooping, black, the tip pale. Head, thorax, abdomen and fore wings a uniform dark olivaceous brown; summit pale, with a dark central spot.

Fore wings lengthened, with outer margin very oblique, scarcely rounded; all markings obscure except the discal spot (which is black and conspicuous) and the scalloped white submarginal line.

The veins, especially veins 2 to 6, are marked with black dashes, indicating two or three extra-discal lines. There is a fine, faint, black marginal line, followed by a pale line at base of fringe; fringe rather paler than wing, with dark spots at the ends of the veins.

Hind wings rather broad, with a slight flattening of outer margin at vein 5; a little paler in colour than the fore wings.

Beneath, fore wing uniformly dusky; discal spot obscure, veins slightly marked with blackish, indicating extra-discal lines; marginal line distinct.

Hind wings as fore wings, but discal spot more distinct, and two extra-discal lines showing as dots on the veins across the wings; marginal lines as above.

This species is very close to *E. lachrymosa*, Hulst, as identified by me, but differs in the duller and more uniform colouring, the lengthened fore wings and straighter outer margins.

Types: ♂, Wellington, 7th April, 1903; ♀, Wellington, 20th April, 1903. It is not very rare at Vancouver (R. V. Harvey) and Wellington, but I have not yet received it from other parts of the Province.

December, 1906

2. *Eupithecia Harveyata*, new species.—Expanse, 25 mm. Palpi long, slender, porrect. Head, front, thorax and ground colour of wings, gray, with a light brown shade; a small brown spot in front of each antenna.

Fore wings with many fine cross lines, most distinctly seen at their terminations on the inner margin. Three of these lines are basal; the intra-discal is double; there are two faint wavy lines in the discal space, one on each side of rather large and distinct round black discal spot.

The extra-discal band consists of three black lines and two included pale spaces. The inner line of the three is marked with black dashes running inwardly on the veins; middle line less distinct, wavy; outer line also fine and wavy. Submarginal space dusky, divided by a conspicuous white scalloped line; marginal line of indistinct black dashes; fringe pale, with blackish mottlings.

Hind wings, with outer margin full; discal spot very small; the beginnings of about six lines on the inner margin, the two extra-discal lines being traceable half across the wing, the others being much shorter; submarginal space dusky; submarginal and marginal lines as on fore wings; fringe rather long, the colour of the fore wings, cut with a darker shade at the ends of the veins.

Beneath, all the wings are clear gray, with the discal dots and marginal black lines distinct. There are also two extra-discal faint lines on each wing, those on the fore wings being diffuse, and showing most plainly as rather large smoky blotches on the costa.

Abdomen gray, with brown mottlings, much paler beneath.

The type specimens, and the only ones I have seen, are two, ♂ and ♀, taken at Vancouver on 6th April, 1903, by Mr. R. V. Harvey, the energetic secretary of our B. C. Entomological Society, after whom the species is named.

3. *Eupithecia Dyarata*, new species.—Expanse, 25 mm. Palpi long, stout, porrect. Head, thorax and fore wings rather dark brown. Abdomen brown, with second segment darker.

Fore wings crossed by numerous undulating blackish lines; basal line diffuse, very indistinct; angled sharply at cell; one or two dark lines within basal space; intra-discal line double, fine, with very distinct angle at cell; discal space rather darker than the rest of the wing, especially on the costa; two or three faint cross lines are included in the discal space, and a very small, hardly visible,

discal spot. Extra-discal line double, the inner one being most distinctly marked, especially on the veins. It runs inwardly from costa to vein 8, then outwardly to vein 6, then in an almost straight line to inner margin. This line is followed by a pale band, then a darker submarginal space rather wider than usual. Submarginal line indistinct, finely scalloped, with black marks on inner sides of scallops. Marginal line black, narrow. Fringe rather long, basal half darker, with dusky spots at ends of veins.

Hind wings with margin slightly flattened at vein 5, paler than fore wings, but sprinkled with numerous dusky scales; five straight diffuse dark lines cross the wing from inner margin to cell; a sixth wavy extra-discal line completely crosses the wing, and this is followed by the submarginal space and white submarginal line as on the fore wings; discal spot very faint.

Beneath bright gray, costa of fore wings marked with about eight dark spots, indicating commencements of lines as on the fore wings, but the lines are diffuse and indistinct, and become obsolete before reaching inner margin; discal spots distinct, rather large.

Hind wings with six dark lines, two intra- and four extra-discal, discal points very small, but distinct.

Type, 1 ♂, Kaslo, 24, iv, 1906, received from Mr. J. W. Cockle.

The species is not uncommon at Kaslo from the middle of April to the end of May. Dr. Dyar recorded it in his "Lepidoptera of Kootenai" as *Eupithecia multistrigata*, Hulst, a species to which it bears a superficial resemblance.

4. *Eupithecia Hanhami*, new species. Expanse, 28 mm. Palpi short and stout, dusky; pectus gray.

Front gray, with a black spot in front of each antenna, and some blackish scales on clypeus. Thorax light gray, with a conspicuous black transverse bar in advance of the middle, posterior thoracic tuft blackish.

Abdomen dark gray, with the first, third and terminal segments and the median line on 4th and following segments lighter; dorsal tufts black.

Fore wings slightly lengthened, bright gray; cross lines distinct, black. Basal line narrow; intra-discal line double; median line also double, angled so as to pass outside the discal dot, which is distinct, large and round. Extra-discal line marked by a series of short dashes on the veins; this is followed by a pale band, brighter than the ground colour of the wing, divided into two by a narrow blackish line, and followed by another line indicated by a row of black dots on the veins; submarginal

space darker gray, with a submarginal zigzag white line; a marginal line of black dashes; fringe dusky, with darker spots at ends of veins.

Hind wings dark gray, much paler on costal area; there are traces of five or six dark lines on inner margin; the extra-discal line shows as an irregular curved line of dots on the veins, extending to the costa; a zigzag submarginal line, distinct and reaching nearly to the costa; this is followed by a paler space, and this again by the submarginal space, which is darker; marginal line and fringe as on the fore wings; discal spot a distinct black point.

Beneath smoky, with the costa of fore wings paler; discal spot lengthened, black; extra-discal line marked by a blackish blotch on the costa; inner boundary of subterminal space marked by a line of black dots on veins, extending across fore and hind wings; a pale submarginal line; marginal line and fringe as above.

Hind wings with distinct discal dot; an incomplete basal and a faintly-indicated extra-discal line; the distinct submarginal line of black dots as on fore wing.

Types, two specimens taken by Mr. A. W. Hanham at Victoria, on fifth June, 1903, and 25th June, 1905, respectively.

5. *Eupithecia Bryanti*, new species.—Expanse, 18 mm. Palpi moderate, rather stout, terminal joint deflected.

Front, thorax and all wings of a dark smoky brown, with the cross lines very faintly indicated; abdomen of the same colour, with the dorsal line paler and the dorsal tufts black; abdomen paler beneath.

Fore wings with basal and intra-discal lines indeterminate; indications of a double extra-discal and a submarginal line; a dark marginal line and a small, round, black discal dot.

Hind wings of exactly the same colour as fore wings, with a small discal dot and indications of five cross lines; the first intra-discal, the second including the discal dot, and the other three extra-discal, rather thick, wavy, the interspaces pale; marginal line as on fore wings. There is an evident indentation in the margin of the hind wings, between veins 5 and 6.

Beneath even, smoky, all the lines showing almost as plainly as above.

Type, 1 ♀, taken 22nd July, 1905, on the international boundary line near the Stickeen River, B. C., by Mr. Theodore Bryant.

I have also six cotypes before me, taken at the same place, and dated 13th to 29th July, 1905. Mr. Bryant reports the species as very common,

6. *Eupithecia obumbrata*, new species.—Expanse, 20 mm. Palpi short and bushy.

General colour of head, thorax, abdomen and wings above a soft smoky gray, without any brown tinge in the type specimens.

Fore wings with the costa very straight; the inner margin is also straight and rather long, and the outer margin is well rounded from the tornus to vein 4, and thence almost straight to the apex.

The markings are not easy to trace in the type specimens, which are in very good condition, but in a specimen that is a little worn it can be seen that the basal space is separated from the median by a double pale line, and that in the same way the discal and submarginal spaces are separated by a similar double line or band. In the discal space there is a pale double line curving regularly out from costa to vein 3 (just missing the very small, but distinct, discal dot), and thence in a wavy line to the inner margin. The extra-discal double line is parallel to this. The submarginal white line is hardly discernible in any specimen I have seen, but its termination is marked by a very distinct single white dot at anal angle, marginal line black; fringe with a pale line at the base, then a row of dark spots almost contiguous, outer half of fringe paler.

Hind wings uniformly dark smoky gray; cross lines indicated by pale marks on the inner margin, and a few black dots on the veins; fringe as on fore wings.

Abdomen dark gray, dorsal line paler, two dark spots on each segment, one on each side of dorsal line.

Beneath, fore wings smoky, without markings basally; the median line is marked by two whitish spots on the costa; a submarginal line is faintly indicated.

Hind wings paler gray, with dusky scales, and with about six dusky brown diffuse lines crossing the wing; discal dots minute black specks.

Types, two females, both taken on 10th May, 1903, at Goldstream, near Victoria, by Mr. A. W. Hanham. This species is nearly allied to *E. scriptaria*, Herr. Sch., and to *E. Regina*, Taylor, also to *Eup. modesta*, described below, but it is, I think, distinct from them all.

I have seen several other specimens taken at Goldsteam, and at other points in the neighbourhood of Victoria. The dates run from 30th April to June 6th.

7. *Eupithecia modesta*, new species.—Expanse, 21 mm. Palpi rather long, not very heavily scaled.

Head, thorax and fore wings above, blackish brown.

Fore wings with all the margins well rounded; basal and intra-discal lines indeterminate; extra-discal line pale, double, wavy, very faint, marked inwardly by feeble dark points on the veins; submarginal line pale (not white, as in so many species), running from the costa in four distinct scallops, until it almost touches the marginal line, then parallel to outer margin, but much less distinct, to anal angle.

Hind wing similar in colour to fore wing. Outer margin rather straight, with slight indentation at vein 5; cross lines not evident; fine black marginal lines and dotted fringe on all wings.

Beneath paler, markings of upper side reflected faintly; three dusky lines cross the fore wing, one just within the discal dot, the second just without it, the third much broader. There is also a submarginal dusky line.

Hind wing, two intra-discal and three extra-discal dusky lines; small, inconspicuous discal dots on all wings.

Abdomen brown above, with a pale dorsal line, most conspicuous on the first segment; beneath light gray.

Types, two specimens, ♂ and ♀, taken by myself in Stanley Park, Vancouver, on 6th June, 1905.

8. *Eupithecia insignificata*, new species.—Expanse, 21 mm. Palpi long, moderately stout, gray above, darker at sides and below.

Head, thorax and fore wings above, clear gray.

Abdomen a little darker, but with median line, a line at extreme base and the whole of the terminal segment, paler; dorsal tufts distinct, black.

Fore wing crossed by many fine blackish lines; basal line (and two within it) and double intra-discal line, gently rounded; discal space with two included lines, curving outward to pass outside the small black discal dot; extra-discal coming out from costa (where it is very distinct) to cell, then in an irregular course (general direction almost straight) to inner margin. This line is marked on the veins by dashes directed inwards. Beyond the extra-discal line is a pale space, divided by a faint hair line, and bounded outwardly by a second hair line, both these lines being parallel to the extra-discal; submarginal space darker, with faint indications of the usual submarginal pale line; a marginal line of dashes, very faint; fringe long and silky, pale, cut with darker shade at the ends of the veins.

Hind wing clear gray on the costa ; indications of five or six dark lines on inner margin ; only one, the submarginal, running almost across the wing ; marginal line and fringe as on the fore wing ; discal dot minute.

Beneath silvery gray, with two extra-discal lines appearing on all the wings ; those on the fore wings arise from rather large dusky spots on the costa ; those on the hind wing are represented by dots on the veins. Discal spots distinct on all the wings; fringes and marginal lines as above.

This species is a rather common one, appearing very early in the year (about the middle of March), at Sallow bloom, and continuing on the wing until about the end of May. It has been taken at Wellington, Victoria and Vancouver. The specimen I have marked as type is one in very perfect condition, and was taken by me at Wellington on 15th April, 1904.

9. *Eupithecia sublineata*, new variety ?—This is a form occurring with *E. insignificata*, but differing from that species in having the fore wing longer and narrower, and the outer margin straighter. The discal spot on the fore wing is larger, and the marginal lines on the under sides of the wings are heavier.

It is quite likely that this may be a distinct species, but perhaps for the present it will be better to consider it as a variety of *E. insignificata*.

The specimen I have marked as type is labelled Wellington, 18th April, 1904.

10. *Eupithecia perbrunneata*, new species.—In Dr. Dyar's paper on Kootenai Lepidoptera (Proc. U. S. Nat. Mus., xxvii, p. 890), he writes : "A specimen in Mr. Cockle's collection comes near the European *lariciata*. The markings are more pronounced and contrasted, the outer pale band being broader and less obscured by its centering line. The discal dots on both wings are well marked."

I have seen this specimen, and have two others quite like it from Kaslo, and also a specimen taken by myself at Victoria many years ago.

I have compared them carefully with British specimens, received through the kindness of Mr. Prout, and am quite satisfied that our B. C. species is not *lariciata*. This name must, therefore, be struck off our list, and *Eupithecia perbrunneata* substituted. The species may be described as follows :

Expanse, 23 mm. Palpi moderate, rather stout, dark brown.

Head and thorax brown of various shades, the front being the darkest and the collar the palest.

Abdomen above pale brown, the second segment darker, the dorsal tufts black, tipped with white.

Fore wings rather long, the costal margin being at least one and a half times as long as the inner margin ; outer margin well rounded. The fore wings are lightly scaled, the scales being brown, with a tinge of ochreous; there are traces of three or four diffuse lines in the basal area, but the form of them cannot be made out clearly in any of my specimens. The first distinct line is the intra-discal ; this is followed by a median line, bent outward to pass the discal spot, and an extra-discal line. These three lines are parallel to each other, and are all of them very distinct on the costa, where they appear as conspicuous blotches. The extra-discal line is punctuated on the veins by dashes pointing inwards. The discal spot is large and darker than the other markings of the wing.

Beyond the extra-discal line is a pale band, widest on the costa, and divided by a fine hair line ; the submarginal space is darker than the rest of the wings, and is a little wider than usual. The submarginal wavy pale line is conspicuous on the costa ; on the inner side of it on the costa is a double brown blotch; the line itself, though distant nearly 2 mm. from the apex of the wing at its commencement, almost touches the outer margin at the tornus.

There is a marginal line of rather heavy dashes between the veins ; the fringe is long, pale at the base, but with darker spots on the median line.

Hind wings, clear in the costal region, but with six brown lines marked on the inner margin, only one of which extends beyond the middle of the wing ; discal dots well marked ; fringe as on fore wing.

Beneath, fore wings clear at the base, and along inner margin ; the commencements of the median and extra-discal lines appear as blotches on the costa, and there is also a large dark apical blotch, corresponding with the costal portion of the submarginal band of the upper side, and this is divided by the reflection of the pale submarginal line.

Hind wings with traces of four cross lines, two intra-discal and two extra-discal, the outermost extra-discal line being marked by rather long dashes on the veins.

The discal dots on all wings as above, but those on the fore wings are rather smaller, and those on the hind wings rather larger than on the upper side.

The three type specimens mentioned above are labelled respectively Kaslo, 23rd May, 1904; Kaslo, 2nd June, 1904, and Victoria, 9th May, 1888.

11. *Eucymatoge Vancouverata*, new species.—Expanse 25 to 30 mm. Palpi long, stout, deflected, dark brown.

Front and anterior portion of thorax paler brown; the rest of the thorax darker, with a transverse white bar in front of the middle. Patagia gray.

The wings have a very variegated appearance, the ground colour and colour of the lines ranging from bright chestnut, through many shades of brown, to nearly black.

Abdomen mottled gray and brown, second segment with a black transverse band; dorsal abdominal tufts blackish.

Fore wing with basal line very near to the base, strongly angled at the cell; discal space bounded inwardly by three dark brown wavy lines, running out from the costa to vein 8, then at right angles to the inner margin.

The discal space is of various shades of brown and gray, darker in the neighbourhood of the intra- and extra-discal lines, and much paler around the large, linear, bright brown discal spot. There are three brown lines in the discal space, all more conspicuous on the costa.

The extra-discal line is distinct, dark brown, parallel with the intra-discal, shaded within, and marked with darker dashes on some of the veins; paralleled outwardly by two other dark brown wavy lines; a bright, distinct, white zigzag submarginal line, edged inwardly with dark brown; submarginal space of a grayer shade, with the veins darker; a thin, black, marginal line; fringe pale, with dark spots at ends of the veins.

Hind wing well rounded, crossed by about seven dark lines, sometimes extending almost to the costa; submarginal line not nearly so distinct as on fore wing; marginal line and fringe as on fore wing; a small dark discal point.

Beneath smoky, fore wing showing traces of lines beyond discal spot.

Hind wing with about five lines, showing mostly as spots on the veins; discal spots distinct, those on the fore wings being smaller and those on

the hind wings larger than those on the upper side ; marginal line and fringe as above.

Legs and under side of thorax and abdomen pale.

This is a very fine species, belonging to the same group as the *Eucymatoge Græfii* of Hulst, as identified by Dr. Dyar, but differing from that species in having the discal spots on the fore wings bright brown instead of black.

I have before me many specimens taken at Wellington between 10th April and 24th August, these dates appearing to indicate two broods. The specimen I have marked as type is labelled Wellington, 3rd July, 1903.

12. *Eustroma Harveyata*, new species.—Expanse, 34 mm. Palpi moderate, not very stout, porrect.

Front and thorax purplish brown.

Fore wings, which are of the same size and shape as in *Eustroma destinata*, Moeschler, are bright yellow, with the markings purplish brown.

Basal line strongly angled at cell ; basal space purplish brown, with traces of two darker included lines ; space between basal line and median band yellow, about 2 mm. wide, with a central purple shade.

Median band purple brown, a little wider on the costa, where it occupies more than one-third of the wing, than on the inner margin ; two cross lines within this band show as yellow marks on the costa, and again faintly on the inner margin ; the inner edge of the median band is parallel to the basal line ; the outer edge forms a slight outward curve from the costa to vein 5, then three blunt scallops pointing outward between veins 5 and 4, 4 and 3, 3 and 2 (the scallops projecting considerably into the extra-discal space), then three smaller scallops in a nearly straight line to the inner margin.

The extra-discal space is yellow, with a submarginal scalloped line of a paler shade, the inner side of each scallop marked with purple ; a purplish lunule on outer margin, below apex of wing.

Hind wing with basal two-thirds purple, with two darker lines, one median and the other bounding the purple ; the outer portion of the wing is yellow, with a zigzag purple submarginal line ; marginal lunules purple.

Beneath, the markings of the upper side are reflected, but the whole of the fore wing, to extra-discal line, is purple, and on the hind wing there is a small purple discal spot, not visible on the upper side.

This species was first taken by Mr. R. V. Harvey, in Stanley Park, Vancouver (11th July, 1904), and has since then been taken in the same locality by other persons.

I have also seen a long series of specimens taken by Mr. T. Bryant, near the Stickeen River. The species also occurs, I think, at Kaslo, and is recorded in Dr. Dyar's "Lepidoptera of Kootenai" under *Eustroma populata*.

The type specimen is a male, labelled "Stickeen R., July 28th, 1905, T. Bryant."

This species is a near ally of the *E. destinata* of Moeschler, and might turn out to be a colour variety of that species.

13. *Zenophleps Victoria*, new species.—Expanse, 30 mm. The species is very nearly allied to *Z. lignicolorata*, Pack. From that insect it differs in the ground colour, which is a very pale coffee colour (as in the "*Ochyria Gueneata*" of Packard), quite different to the usual gray or wood brown of *Z. lignicolorata*, and in the form of the extra-discal line on the fore wing. This line in *Z. lignicolorata* leaves the costa with an outward curve, and has a large tooth projecting outwards between veins 2 and 5. In *Z. Victoria* the whole line is almost straight in its general direction, and has only a very slight projection at vein 4, in place of the prominent tooth.

I have only seen two specimens, both taken by Mr. A. W. Hanham near Victoria. One of these, which is a ♀, dated 29th August, 1901, he has generously placed in my collection, and I have labelled it as the type of the species.

14. *Hydriomena autumnalis*, Strom.? var. *Columbiata*, new variety.—Expanse, 40 mm. I propose this name for a form which has so far been taken only on Vancouver Island, and which is nearer to some of the lighter varieties of the European *autumnalis* than to any of our characteristically western Hydriomenas.

It differs from *autumnalis* in the larger size and the proportionately longer wings, in the clearer, pale greenish ground colour, and the more distinct lines and bands, which in their form and direction are very nearly as in *H. autumnalis*.

It would, perhaps, not be worth while to give this form a distinctive name, but for the fact that it differs very materially from another form common in the Stikeen region, which appears to represent typical *autumnalis* in this Province.

The insect usually labelled *H. autumnalis* or *H. trifasciata* in western collections is, in my opinian, *Hydriomena ruberata*, Freyer, a name which must now be added to our North American lists.

My four specimens of *H. Columbiata* are dated Victoria, 29th March, 1903, and Wellington, 16th, 23rd and 27th May, 1904. The one taken on the 16th of May bears the type label.

15. *Hydriomena manzanita*, new species.—Expanse, 43 mm. Palpi short and stout, deflected.

Antennæ of male thickened, very finely ciliate below. Head and thorax dark slate colour. Abdomen pale brown.

Fore wings, costa strongly bent at base, rather straighter than usual for the remainder of its length; colour of wing slate gray, with a bluish tinge in some places. Cross lines very indistinct.

Basal line acutely angled on median vein; intra-discal line directed outward from costa to median vein, where it is twice as far from the base as at its origin on the costa; thence at right angles to inner margin. Extra-discal line rather wide, evenly curved outwardly from costa to inner margin, and marked on the veins with black dashes; submarginal shade smoky gray, three times as wide at the costa as on the inner margin.

There is a bluish shade on the inner side of the extra-discal line, extending from the costa to the median vein, and a blotch of the same colour on the costa beyond the extra-discal line; there is also a faint submarginal line of the same colour dislocated and enlarged at the costa. In very fresh specimens there is sometimes a narrow line of this blue colour bordering the extra-discal line on both sides, and the submarginal shade on its inner margin. Fringe short, of the ground colour of the wing.

Hind wing sickly pale brown, lighter basally, with a darker median line and broad submarginal band.

Beneath without markings, fore wing smoky, hind wing pale brown.

This is a very distinct species, not likely to be confused with any other American form. I have found the larvæ commonly feeding concealed between the leaves of the Arbutus tree. The perfect insect emerges from the pupa early in April, and continues on the wing until the first week in May. It has not so far been found on the mainland of B. C., but is not rare on Vancouver Island.

The type specimen is a ♂, labelled Wellington, 21st April, 1903.

16. *Xanthorhoe pontiaria*, new species.—Expanse, 35 mm. This species, together with the next to be described, passed in the old

collections as *X. fluctuata*, and it may be best described by comparing it with that species. *X. fluctuata* is one of the commonest of the European Geometridæ, and is also abundant in the eastern part of this continent. I have, therefore, been able to secure a fine series for comparison.

X. pontiaria is larger and paler, and the median band is not nearly so black and contrasting as in *fluctuata*. The intra-discal line in *pontiaria* is even and regular in its course (as in *X. defensaria*, for instance), while in *fluctuata* it is very irregular, encroaching on the median band at the veins, particularly at vein 8. The extra-discal line in the same way has many sharp angles in *fluctuata*, which angles are all rounded off in *pontiaria*.

In fresh specimens of *pontiaria* there is a slight tinge of pink in the central band, which is never seen in *fluctuata*.

I have four good specimens of *pontiaria* before me, namely, one male, Salem, Oregon, 2nd June, 1904, and three females, Wellington, 20th June, 1905; 26th June, 1904, and 23rd May, 1905. The last named I have labelled as a type.

17. *Xanthorhoe fossaria*, new species.—Expanse, 35 mm. This is a species somewhat nearer to the *munitata* group than the one last described.

It has been sent to me from Laggan, 6,850 feet altitude, and from Mount Cheam, B. C, having been taken in the former locality by Mr. F. H. Wolley Dod, and in the latter by Messrs. Harvey and Bush. It is evidently a mountain-loving species, and the scaling of the wings is of that peculiar hairy character so often seen in forms from high altitudes or extreme northern localities.

The wings are long, rather narrow and pointed, the inner margin being shorter than in *munitata* and its allies.

The colours are dull, and all the markings are obscure, the usual lines being present, but not easily made out. There is a dull pinkish shade overspreading the median band. The intra-discal line is much straighter than in *convallaria* or *nemorella*.

The marginal line is made up of almost contiguous black dashes, not of distinct dots in pairs, one on each side of each vein, as in *fluctuata* and *pontiaria;* and the fringe is dusky, with a darker line centrally, and lacks the dark spots at the ends of the veins, which are so distinct in the two species last named.

I have before me four specimens, three males and one female, from Laggan, Alberta, all dated 20th July, 1904, and two others, both males, from Mt. Cheam, B. C., dated 5th August, 1903 (Mr. A. H. Bush.)

One of these Cheam specimens bears my type label.

18. *Leptomeris subfuscata*, new species.—Expanse, 30 mm. The whole insect, except the front, which is a little darker, is of soft warm fawn colour, of a much redder tint than the common *Eois inductata*.

On the fore wings are three distinct lines, darker than the ground colour; the intra-discal and median lines are heavy and diffuse, running out at a sharp angle from the costa for a very short distance, and then in a nearly straight line parallel to the outer margin, to the inner margin. The extra-discal line is narrow, distinct, wavy, darker than the other lines, parallel to them.

The submarginal space is divided by a pale wavy line, parallel to the outer margin of the wing; the fringe is concolorous with the submarginal space, from which it is separated by a very fine and faint black marginal line.

All the lines of the fore wings are continued on the hind wings, but the median and extra-discal lines are here rather farther apart.

Beneath the basal line is absent, but all the other markings are as above, only much more distinct than on the upper side.

The discal points are usually absent (not always) above, but are quite distinct beneath.

I have seven males and two females of this species.

The types, ♂ and ♀, were taken at Goldsteam, near Victoria, by Mr. A. W. Hanham, on 24th May, 1902, and 7th June, 1903, respectively. I have another pair from Goldsteam dated 7th June and 26th June; three males from Victoria, 30th May, and three males from Vernon, sent to me by Mr. R. V. Harvey, who took them on the 11th and 15th August, 1904.

This species stood in our collections for a time as *Eois inductata*, and later as *Cinglis fuscata* (which does occur also in B. C.), but the generic characters will serve to distinguish it from either of these species.

19. *Deilinia Bryantaria*, new species.—Expanse, 30 mm. This species belongs to the same section as *D. erythemaria* and *D. pacificaria*.

It seems at first sight to be very near to the last named, but it differs in the following particulars:

The front is not ochreous, but white, with a blackish bar in front of the antennæ, as in *Diastictis*.

The wings are a little shorter and wider than in *pacificaria*, and are dusted all over quite thickly with cinereous specks, not striæ, as in the two species above named. The cross lines on all wings are faint, but appear to be more evenly rounded and less wavy than in *erythemaria* and *pacificaria*.

Beneath, the dense dusting gives a very different appearance to the scattered strigations in the other species.

This species was found by Mr. T. Bryant, on the international boundary line, near the Stickeen River, in the early part of June, 1905. He reports the species as being rather common.

The type specimen in my cabinet is dated 13th June, 1905, and is a ♂.

20. *Enypia Packardata*, new species,—

= *Cleora umbrosaria*, Packard, Monograph, p. 453, and Pl. xi, fig. 33, 1876 (part);

not *Cleora umbrosaria*, Packard, Proc. Bost. Soc. Nat. Hist., xvi, 23, 1874.

Packard described *Cleora umbrosaria* in 1874, from one male, received from Hy. Edwards, and taken in California. He distinctly states that the antennæ were "*broadly pectinated*." Had it not possessed this character he would certainly not have placed it in the genus *Cleora*.

In his Monograph, two years later, Packard republishes his description, but speaks of having at that time *four* males, two at least being from Vancouver Island, collected by Crotch.

One of these Vancouver Island specimens he figures, and strangely enough depicts it with *pectinated antennæ*. But whether Packard's original Vancouver Island specimens had pectinated antennæ or not, it is quite certain that no such specimens exist in our collections to-day. I am quite prepared to believe that the original Californian type of *umbrosaria* had, as Packard states, broadly pectinated antennæ, and though for the moment the species has been lost sight of, it will, I am confident, some day be rediscovered, but our B. C. species cannot be the same, and, therefore, needs a new name.

It is not a *Cleora*, nor is it a *Nepytia*, as Hulst styles *umbrosaria* in his latest catalogue, for in both these genera the males have fully pectinated antennæ, but it is a near ally of *Enypia venata*, and like that species has in the male simple, slightly-thickened antennæ.

I propose to call it

Enypia Packardata, new species.—Expanse, 40 mm. Palpi short, third joint deflected.

Front and vertex grayish white; antennæ dark gray, slightly thickened in the male.

Thorax smoky gray ; abdomen above, white.

All wings pale gray, with numerous dark gray striations.

Fore wing crossed by two scalloped blackish lines ; the intra-discal consists of four scallops rounded outwardly ; this line has its origin on the costa, nearer the base than usual, and reaches the inner margin about one-third out from base. The extra-discal line leaves the costa about 2 mm. from the apex, and reaches the inner margin at about double that distance from the anal angle. It consists of a series of scallops, rounded inwardly, but produced outwardly as points or dashes on the veins. The scallops between veins 1 and 2, and between veins 4 and 6, are much larger than the others. There is no marginal line; the fringe is concolorous with the wing, with dusky points at the ends of the veins.

Hind wing similar in colour, but with only the extra-discal line present.

Discal spot, on fore wing lengthened, on hind wing an indistinct point.

Beneath paler ; space between vein 2 and the inner margin of fore wing quite clear of striæ ; discal spot and extra-discal line faintly indicated on the fore wing, the line showing most strongly in three black spots below costa ; the dots on the fringe at the ends of the veins are blacker and much more distinct below than above.

This species is well figured (except as regards the antennæ, which are quite incorrect) in Packard's Monograph, Pl. xi, fig. 33.

I have described it from six specimens, all taken at Wellington, and dated June 20th to August 16th. The earliest specimen, a male, is indicated as type.

A female specimen from Mt. Cheam, B. C., given to me by Dr. Fletcher, differs in having all the cross lines bordered with a dusky shade, and in being brown instead of gray in all markings.

All the types referred to in this paper are in my own cabinet.

Eupithecia Youngata, n. sp.*—Expanse, 25 mm.—Palpi not very long, bushy, blackish.

*Reprinted by request from "The Ottawa Naturalist," Vol. XIX, No. 12, March, 1906, pages 226-7.

Front dusky, cinereous. Thorax brown, with a dark transverse band anteriorly. Abdomen as thorax, 2nd segment a little darker, posterior edge of each segment whitish.

Fore wings obtuse at apex, outer margin well rounded, same colour as thorax, the costa rather darker and the cross lines distinctly lighter than the ground colour; basal line double, very irregular, being angled sharply outwardly at cell and below vein 2; median line also double, not well marked, making a sharp outward angle to include the conspicuous black discal dot, then running in an almost straight line to middle of inner margin; extra-discal line also double, dislocated at vein 6, then in a regular curve parallel to outer margin; both median and extra-discal lines show in more or less well defined whitish spots on veins 2 to 6 inclusive; and there are short black dashes on each of these veins between the median and extra-discal lines; submarginal line white, conspicuous, regularly scalloped at each vein, and forming a distinct V at anal angle; a fine black marginal line; fringe dotted with dark brown between veins.

Hind wings well rounded, lighter brown than fore wings, with six darker lines; the first two are basal, and do not extend further from inner margin than to vein 2; the next two lines are extra-discal and almost complete; the two outer lines extend completely across the wing; a very small and faint discal dot; marginal line and fringe as on fore wings.

Beneath paler; fore wings with a linear discal dot, and the extra-discal markings of the upper surface reproduced; basal portion of wings without markings except a dark spot on the costa, indicating the position of basal line.

Hind wings as above, but with all the lines more regular, and reaching to the costa; the discal spot is distinct, black; first extra-discal line is diffuse and very evident; the three outer lines appear as spots between the veins, the outermost line being least conspicuous. The under side of thorax and of the basal segments of the abdomen is very pale, almost white, but the posterior portion of the abdomen is nearly black.

Type, one specimen, Meach Lake, Ottawa, 7th June, 1905, C. H. Young. Co-types, two specimens, Catskill Mountains, 2nd and 10th July, 1901 (No. 1), R. F. Pearsall. Named after Mr. Young, from whom was received the very beautiful and absolutely perfect specimen which is designated the type of the species.

NOTES ON HEMIPTERA TAKEN BY W. J. PALMER, NEAR LAKE TEMAGAMI, ONT.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

These notes refer to a small but interesting collection of Hemiptera taken about Lake Temagami in August, 1906, by my friend, Mr. William J. Palmer, of Buffalo. Before starting for a brief vacation trip to northern Ontario, Mr. Palmer very kindly offered to collect Hemiptera for me as time and circumstances would permit. On four days only was he able to do any collecting, but considering the unfavourable conditions, the results were remarkably good, both as to the amount and character of the material brought home. This material represents sixty-two species, including several very interesting forms, and four that may prove to be still undescribed. Among the more interesting species taken may be mentioned *Plagiognathus annulatus*, Uhler, *Dræculacephala Manitobiana*, Ball, *Thamnotettix eburata*, Van Duzee, *Thamnotettix waldana*, Ball, *Thamnotettix Smithii*, Van Duzee, and *Cicadula lepida*, Van Duzee. In the case of five of these six species the known range has been considerably extended. The rediscovery of *Thamnotettix eburata* shows conclusively that this is a boreal species, probably having the southern limit of its range in the Adirondack Mts. It is not unlikely that it will yet be found in the White Mts., and possibly elsewhere in northern New England.

The particular localities where collections were made by Mr. Palmer, and the dates, are as follows: Red Cedar Lake, August 9th: Fox Island, at the other end of Red Cedar Lake, on August 10th; the lumber camp on Island Lake, August 12th; and Swamp Creek, August 14th. All of these places are within forty or fifty miles of Lake Temagami, in a south-easterly direction.

Banasa dimidiata, Say.—One large and deeply-coloured example was taken at the Island Lake lumber camp on August 12th.

Podisus serieventris, Uhler.—One fine large specimen from Red Cedar Lake, August 9th. As stated in my Annotated List of North America Pentatomidæ, I distinguish this species from *maculiventris* by the short ventral spine, less acute humeri, etc. The present example is fully as large as any I have seen of *maculiventris*, and is much more deeply coloured, with the wings of a rich metallic green, and some of the punctures, especially on the pronotum, tinged with the same colour.

Ligyrocoris contractus, Say.—One specimen from Red Cedar Lake, August 9th, and one from Swamp Creek, both females. I have this

species from Lake Placid, in the Adirondacks, and from Montreal, and what is probably the same species was taken at Beulah, N. M., by Dr. Henry Skinner.

Corythuca, sp.—This is the most abundant Tingid throughout the northern States and Canada. It is closely allied to *arcuata* and *juglandis*, and is the "small variety" of *arcuata* mentioned in my list of Muskoka Hemiptera. Ten examples from Fox Island and one from Swamp Creek are in this lot.

Coriscus incriptus, Kirby.—Island Lake lumber camp, August 12th.

Coriscus vicarius, Reut.—Taken at Island Lake and Red Cedar Lake. This species seems to be common toward the north. I took it in abundance at Lake Placid, in the Adirondacks. I cannot follow Kirkaldy in placing this as a synonym of *Coriscus propinquus*, Reut.

Miris affinis, Reut.—Taken at all localities.

Phytocoris eximus, Reut.—Swamp Creek, August 14th.

Phytocoris pallidicornis, Reut.—Red Cedar Lake. Several examples.

Lygus, sp. nov.—Swamp Creek, August 14th. A very pretty red species.

Lygus pratensis, Linn.—Apparently common with its variety *flavonotatus*, Prov.

Lygus invitus, Say.—Several taken at Island Lake lumber camp, August 12th.

Lygus pabulinus, Linn.—A few with the preceding.

Pœcilocapsus lineatus, Fabr.—One example from Fox Island, in Red Cedar Lake.

Monolocoris filicis, Linn.—Apparently common.

Neoborus, sp. nov.—Island Lake, August 12th, and Swamp Creek.

Macrolophus separatus, Uhler.—Island Lake, August 12th, three examples. These differ from specimens from Maryland and Florida now in my collection, in being proportionately longer and more slender, with the colours somewhat paler and the markings more clearly defined. What seems to be a smaller form of the same species I found in numbers on bushes at Gordon Town, near Kingston, Jamaica. This would give the species a very wide distribution. It is a pretty insect, and closely resembles *Dicyphus*.

Rhinocapsus Vanduzei, Uhler.—One specimen was taken at Red Cedar Lake, August 9th.

Orthotylus chlorionis, Say.—Several from Red Cedar Lake and Island Lake.

Plagiognathus obscurus, Uhler.—Several large and clearly-marked examples of this common species were taken at the several localities.

Plagiognathus politus, Uhler.—Swamp Creek, August 14th, and Island Lake.

Plagiognathus annulatus, Uhler.—A very black little species, of which two examples were taken at Island Lake, August 12th. Kindly determined for me by Mr. Otto Heidemann.

Ceresa brevicornis, Fitch.—One small male was taken on Fox Island in Red Cedar Lake. Mr. Palmer kept a close watch for the Membracidæ, but this was the only species taken.

Otiocerus Coquerberti, Kirby.—One pair of this pretty species was taken at Island Lake, August 12th. The elytra are more suffused with yellow than in the specimen from western New York.

Cixius stigmatus, Say.—Apparently abundant. In this material there is a conspicuous blackish vitta before the middle of the elytra in the female. The male elytra shows but faint traces of this maculation, but in both sexes there is a fuscous spot on the stigmata, and the nervures are conspicuously dotted. In the eastern States and Canada we have at least three closely-allied species of *Cixius*, that I identify as follows:

a. Vertex triangularly and subacutely produced anteriorly, its apex very nearly attaining the base of the front, and almost bisecting the transverse compartment on the apex of the head. Front clypeus and mesonotum black, with the facial carinæ pale. Styles of the males broad, about equalling the pygofers.....*stigmatus*.

—. Vertex obtusely rounded before, not nearly attaining the base of the front, transverse compartment much less narrowed at the middle. Styles of the male distinctly shorter than the pygofers.....b.

b. Larger, piceous brown, becoming blackish on the front, sides of the mesonotum, and on the abdomen. Elytra with very faint brownish clouds, or almost transparent, with dotted nervures.....*pini*.

—. Smaller. Black, with the carinæ more or less pale; elytra more strongly spotted and dotted on the nervures..... ... *colæpium*.

Delphax furcata, Prov.?—One female taken at Island Lake agrees with Provancher's short description and my former determination of this species, except that the front and vertex are black. It may be a large dark form of *pellucida*, but I believe when the male is placed it will prove distinct.

Lepyronia quadrangularia. Say.—Two from Island Lake, and one very dark example from Fox Island, in Red Cedar Lake.

Aphrophora parallela, Say.—One example from Red Cedar Lake, August 9th.

Aphrophora Saratogensis, Fitch.—One pair taken with the preceding.

Clastoptera obtusa, Say.—Very abundant at all stations. Generally taken on willows. These individuals average much darker than those from New York State.

Clastoptera proteus, Fitch.—This species seems also to have been abundant, especially about Red Cedar Lake. Nearly all the specimens brought home by Mr. Palmer were of the black form. These have only the lower surface of the face and the legs yellow, and the apex of the elytra, and sometimes the base of the costal area, are brownish; a few have two transverse bands on the front of the pronotum, the clavus, except a broad longitudinal median vitta, and an oblique vitta across the middle of the corium, yellow.

Gypona flavilineata, Fitch.—Two females were taken at Red Cedar Lake, August 9th.

Gypona Quebecensis, Prov.—Two males and two females and larvæ were taken at Island Lake and Red Cedar Lake. This species is now generally placed as a synonym of the preceding, but I still think it should be kept distinct, although on further study the name may have to be sunk as a synonym of one of Burmeister's unidentified species. It may be distinguished from *flavilineata* by its smaller size, deeper green colour, longer vertex, more approximate ocelli, more numerous transverse nervures on the elytra, and different form of the last ventral segment of the female. This seems to be a more northern form, which I have taken about Buffalo from Hemlock bushes.

Diedrocephala coccinea, Forster.—Numerous specimens of this insect were brought home by Mr. Palmer. Apparently they were common and generally distributed.

Dræculacephala Novæboracensis, Fitch.—Several were taken at Red Cedar Lake, and one at the Island Lake lumber camp. These specimens are a little smaller, with the black markings of the vertex more distinct than in those captured about Buffalo.

Dræculacephala Manitobiana, Ball.—One male taken at Swamp Creek, August 14th. This individual agrees in all respects with Prof. Ball's figure and description, except that the male plates are distinctly

narrower and more produced, being intermediate in form between his figures representing *Manitobiana* and *Novæboracensis*. He records it from Colorado and Manitoba. This is its first recorded occurrence in the east of which I am aware.

Bythoscopus fenestratus, Fitch.—One strongly-marked female from Island Lake.

Bythoscopus pruni, Prov.—Island Lake lumber camp, August 12th.

Idiocerus Provancheri, Van Duzee.—One individual taken at Island Lake.

Idiocerus suturalis, Fitch, var. *lunaris*, Ball.—Three males and three females are among the material from Island Lake.

Agallia sanguinolenta, Prov —Taken at Island Lake and Red Cedar Lake.

Platymetopius acutus, Say.—Taken at all stations, and apparently common.

Athysanus parallelus, Van Duzee.—One male taken at Island Lake.

Athysanus vaccinii, Van Duzee.—Red Cedar Lake. I have taken this species at Hamburg and Lake Placid, N. Y.; Woodbine, N. J.; and in Colorado.

Athysanus striatulus, Fallen.—Swamp Creek, August 14th. One pale example that I believe should be referred here as this species is identified by Osborn and Ball.

Scaphoideus immistus, Say.—Island Lake. One example.

Thamnotettix eburata, Van Duzee.—Mr. Palmer brought home a good series of this northern species, taken at all localities where he collected. Since describing this species in 1889 I have seen but one additional specimen, taken by Mrs. Slosson, near Lake Champlain.

Thamnotettix, sp.—One example from near Island Lake.

Thamnotettix subcupreus, Prov.—Apparently not at all rare at Island Lake. I have recently taken it as far south as Cape May, N. J.

Thamnotettix waldana, Ball.—One male and four female examples from Swamp Creek, August 14th. These agree well with Prof. Ball's description, but two individuals are a little darker and more clearly marked, with almost the entire length of the claval nervures, and some interruptions on the discal nervures of the corium white.

Thamnotettix inornata, Van Duzee.—One example taken on Fox Island, Red Cedar Lake.

Thamnotettix Smithii, Van Duzee.—One female from Swamp Creek. This example agrees in every essential particular with my description of

the male. Unfortunately the tip of the abdomen has been so compressed it is impossible to describe exactly the form of the last ventral segment, but apparently it is short and truncated or feebly rounded behind, without a median notch; the pygofers are long, yellowish, with the narrow margins and the oviduct deep black. The yellow margin of the connexivum is narrower than in the male.

Cicadula 6-notata, Fallen.—Island Lake, August 12th.

Cicadula lepida, Van Duzee?—Two females that seem to be pale examples of this species were taken at Island Lake and on Fox Island, in Red Cedar Lake.

Cicadula, sp.—One example from Island Lake.

Gnathodus viridis, Osborn.—One unusually large example from Red Cedar Lake. This has the basal angles of the scutellum infuscated, but does not seem to differ otherwise.

Empoasca atrolabis, Gillette.—One specimen taken at Island Lake, August 12th.

Empoasca unicolor, Gillette. Several from Swamp Creek. I have taken this species at Milan, Ohio, and in numbers at Hamburg, N. Y. It is a little larger and deeper green than *Empoasca obtusa*, Walsh.

Empoasca mali, Le Baron.—A pair of this species is in the material from Fox Island.

Typhlocyba tenerrima, H. S.—Two examples of this European species were taken at Swamp Creek.

Psylla carpini, Fitch.—Island Lake. Three examples. In a revision of this group this name will have to be changed, as it is preoccupied by an European species in the same genus.

Livia, sp.—One specimen, too immature to admit of correct determination.

THE PUPATION OF EUVANESSA ANTIOPA, L.

BY JAMES FLETCHER, OTTAWA.

On the morning of November 8th I was fortunate enough to watch the pupation of a caterpillar of *Euvanessa antiopa*, L. The operation has often been described, but it seems worth while putting another observation on record, which was carefully watched by Mr. Arthur Gibson and myself, from the time the larval skin first burst until the cremaster was firmly

fixed in the silk. The chrysalis first appeared through the black skin as a white dash in the middle of the second thoracic segment. This slit was gradually enlarged by the contortions of the chrysalis, the split running down the body very slowly until the head portion was withdrawn from the skin. After that, by a continuation of laboured expansions and contractions of the body, the skin was gradually worked back until it reached the last segment but one of the chrysalis on the dorsal side; but the head and first segments of the larval skin had then only just passed the tips of the wing-cases on the ventral side. Then the skin was gradually slipped back two more segments on the ventral side, after which the cremaster was withdrawn from beneath the skin and was, evidently with much exertion, slowly pushed up until it reached the pad of silk. Here, immediately it touched the silk, it was worked round and round vigorously, and there was a distinct discharge of a pinkish glutinous liquid, by which the cremastral hooks were apparently cemented into the silk, and which gave a pink tinge to the part where the hooks were attached. I was surprised to see this liquid, and at once asked Mr. Gibson to confirm the observation through a lens, which he did. By the twisting of the body the cast-off skin was now gradually worked off, and the chrysalis continued for about 15 seconds twisting the cremaster into the silk. The whole operation, from the time the skin burst until the chrysalis was attached to the silk, was 12 and 15 seconds, but the chrysalis did not take its permanent hardened form for an hour afterwards, and the thorax remained white and facelike for some hours.

As far as we could observe, there was no grasping of the larval skin between the abdominal segments of the chrysalis, but the moisture with which the whole surface of the new chrysalis was bathed seemed sufficient to hold it to the skin and keep it from falling until the cremastral hooks were worked into the silk.

The larva was one of a belated brood which was collected on Saturday, October 27th. There had been several sharp frosts, and the thermometer was almost at the freezing point when these caterpillars were rescued. The leaves on the willow tree where they were found were mostly frostbitten or ripened to a yellowish colour. When brought into the office, the most of them recovered and fed, but a few were apparently too far starved and died.

Pupation of those which survived took place from Nov. 5th to 12th.

A CASE OF PSEUDOPARASITISM BY DIPTEROUS LARVÆ.

BY WILLIAM A. RILEY, CORNELL UNIVERSITY.

Recently a medical friend, Dr. A. E. Ayler, called my attention to some "worms" which he had found under peculiar conditions.

A patient, an elderly lady of one of the best families, was suffering from a malignant tumor—a melanotic sarcoma—located in the small of the back. The tumor was about the size of a large walnut. On examination the doctor was surprised to find, close to the stalk and between the tumor and the body, some ten or twelve "worms," which were feeding upon the diseased tissues. Although they had irritated and caused a slight hemorrhage, neither the patient or others of the family knew of their presence. Any discomfort which they had caused had been attributed to the sarcomatous growth.

Four of the specimens, which proved to be dipterous larvæ, had been preserved alive. Although they were for three days without food, they pupated, and, about a week later, there emerged two adults of the genus Sarcophaga. From my knowledge of analagous cases I assumed that the species was the common European *S. carnaria*, but on looking the matter up more fully I find that this species does not occur in the United States, and that the references to it "undoubtedly refer to other species, probably several" (Aldrich, Cat. N. Am. Diptera, p. 511). Dr. O. A. Johannsen has kindly examined the flies for me. Unfortunately, the specimens were females, but he states that they probably belong to an undescribed species.

The infestation occurred during the latter part of August. It is probable that the adult was attracted by the odour of the discharges, and deposited the eggs or living maggots upon the diseased tissues. This might readily be accomplished so quickly as to completely escape notice.

A number of analagous cases of larvæ of *Musca erythrocephala*, and of *Sarcophuga carnaria* infesting the nasal passages, the auditory meatus, or open wounds, are to be found in medical literature. Kuchenmeister (Manual of Parasites, Eng. trans., 1857, Vol. 2, p. 98) states that in malignant inflammation of the eyes the larvæ of these two species even nestle under the eyelids, and, in Egypt, for example, produce a very serious addition to the effects of smallpox upon the cornea.

GEOMETRID NOTES.

BY RICHARD F. PEARSALL, BROOKLYN, N. Y.

The genus Trichodezia, Warren, established in 1895 (Nov. Zool. 11, Part 2, page 119), will now contain *two* of our species. In a former paper (CAN. ENT., Vol. 38, p. 38) I stated that *Euchæca albovittata*, Guen., should, as Mr. Warren placed it, be recognized as the type of this genus, and ventured to predict that *Euchæca Californiata*, Pack., would go with it. Since then, through the kindness of Mr. Beütenmuller, of the Amer. Museum of Nat. History, N. Y., I have received a male of this species, and find the peculiar generic characters present. These principal characters are the venation of the hind wings and the peculiar brush of upturned hairs upon the under side above the inner margin, and near the base of the primaries in the male. In an arrangement of the genera, it will find a natural position somewhat remote from *Euchæca*. Many other genera contain material as widely variant. *Orthofidonia*, with *exornata*, Pack., as its type, is an instance, for *semiclarata*, Walk., and *vestaliata*, Guen., which Dr. Hulst places under it, while closely related to each other, are not congeneric with *exornata*.

Mr. Edward Meyrick, in his "Classification of the Geometrina of the European fauna, 1892," was closely followed and frequently quoted by Dr. Hulst in 1896. Mr. Meyrick says: "The constant and uniform anastomosis of veins 9, 10 and 11 of fore wings also affords a very distinctive feature, equally absolute, ... it has the effect of producing a constant auxiliary cell," which he terms the areole. While this may be true of the European Geometridæ, our species seem less stable in their structure. In treating some time ago of the genus Nyctobia, Hlst. (CAN. ENT., Vol. 36, p. 210), I pointed out the variation in number of accessory cells in the wing of *N. limitaria*. Walk., and the inconsistency prevails, it seems, in other members of the Lobophora group. My attention was called to this fact by Mr. J. A. Grossbeck, who in an endeavour to identify some material, with specimens of *Philopsia nivigerata* = *canavestita*, Pears., in the Hulst collection, found the cells variable in

the individuals there gathered. One had a single cell, the other two had two cells each.

Now, the only point in which the genus *Philopsia*, Hulst, differs from *Talledega*, Hulst, is in the number of accessory cells, and as these have proven inconstant in other material which I have examined, it follows that one of these genera must fall.

Philopsia having priority of page, though not of date, will stand, and *Talledega* becomes a synonym of it, the species under it being transferred to *Philopsia*.

In support of this view, I will state that last spring I received from Middle California several specimens, which I at once supposed to be dark, well-marked individuals of *canavestita*, but on a close examination I found they all had *two* accessory cells, and, therefore, must go into *Talledega*. I had seen a single specimen from the same region among material sent me by Dr. Barnes, and I came near describing them as new, but the key to the trouble was in the variable accessory cell, and its solution works out the change I have indicated.

BOOK NOTICE.

GLI INSETTI, LORO ORGANIZZAZIONE, SVILUPPO, ABITUDINI E RAPPORTI COLL UOMO.—By Prof. Antonio Berlese, Director of the Royal Station for Agricultural Entomology in Florence. Milan, Societa Editrice Libraria, 1906. Published in parts at one lire each.

With such excellent recent general American books on insects as those of Kellogg and Folsom, it would seem difficult for a book in a foreign language to meet any great demand in this country, yet the excellent work of Professor Berlese, of which seventeen parts have already been published, will undoubtedly prove a very important addition to the libraries of all institutions in which advanced morphology is being studied, and in all laboratories in which the study of insects is undertaken from any point of view.

Berlese is a master, a man of broad ideas, thorough training, admirable in technique, clear in demonstration, an excellent writer, and a capable draftsman. His work when completed will be both sound and comprehensive. It will comprise two volumes, of which the first will in a

general way contain the anatomy and the second the biology of insects. The first volume will consist of from seven to eight hundred pages, and will be accompanied by about one thousand figures. Of these, 550 pages have been published in seventeen parts, and the printed parts contain six hundred figures and four plates.

The subjects considered in the first volume, by chapters, are :

I. Brief history of entomology.
II. Size of insects.
III. Plan of the insect structure.
IV. Embryology in general.
V. Morphology in general.
VI. Exoskeleton.
VII. Endoskeleton.
VIII. Muscular system.
IX. Integument and its structure.
X. Glands.

There still remain to be published chapters on the nervous system and organs of sense, organs of digestion, organs of circulation, organs of respiration, organs of secretion, and sexual organs. In the part already completed the chapters on morphology are marvels of detail and thoroughness. The work itself is a large octavo, and more than ninety pages are devoted, for example, to the study of the exoskeleton of the head, while nearly eighty pages are occupied with the treatment of the muscular system. Nearly all of the numerous and strikingly apt illustrations are original, having been drawn by Dr. Berlese himself. Each section of the work is followed by a very complete bibliography, and the author has shown a perfect knowledge of the work of other men, the publications of American authors having been considered and studied with a thoroughness quite unusual among European authors.

The second volume, which has been reserved for the treatment of the biology of insects, will contain a careful consideration of all questions of economic importance, and it will undoubtedly be of interest to learn from this work Berlese's final views on the subject of parasitism, and especially the relations of insects and birds, upon which point he has long been at odds with other Italian zoologists. L. O. HOWARD.

Mailed December 10th, 1906.

INDEX TO VOLUME XXXVIII.

Abacobia carbonella, 348.
Academy of Science of St. Louis, 131.
Achylodes Melcheri, n. sp., 176.
Acidalia subalbaria and some allied forms, 111.
Acknowledgments, 134.
Acroneuria pumila, n. sp., 335.
Adelpha Orinoco, n. sp., 76.
Ædes auratus, n. sp. (figs.), 313.
" *pertinax*, n. sp. (figs.), 316.
Æschna, Ontario species, 149, 150.
Æschnidæ, Ontario species, 108, 149.
Æthilla Buffumi, n. sp., 174.
African Homoptera, new, 154.
Agallia sanguinolenta, 410.
Agapostemon, Synopsis of species, 304.
Agrion resolutum, 108.
Agrioninæ, Ontario species, 107.
AINSLIE, C. N., articles by, 44, 275.
Alabama (Aletia) argillacea, 220.
Alberta, list of Lepidoptera of, 45, 89, 253.
Albuna pyramidalis, 266.
Amphiagrion sancium, 107.
Amydria, notes on, 347.
Anacampsis nanstrigella, n. sp., 121.
Anagoga pulveraria, 263.
Anax junius, 150.
Another Geometrid tangle, 70, 118.
Ants in houses, to get rid of, 70.
Andrena metallica = *metallescens*, n. nom., 166.
Andrena succinta, 166.
Annemoria bistriaria, 257.
Anomalon pseudargioli, 181.
Anopheles crucians, 296.
Anthophora, species from Washington State, 277.
Aphidæ, Catalogue of genera and list of new species from 1885 to 1905, 9, 135, 202.
Aphodius larrea, 146.
" pumilus, 146.
Aphrophora parallela, 409.
" Saratogensis, 409.
Apis fasciata = mellifera *Lamarckii*, n. nom., 166.
Apis zonata = dorsata *Binghami*, n. nom., 166.
Aplodes Hudsonaria, n. sp., 206, 257.
Apocheima Rachelæ, 263.
Aradus Behrensi, 198.
" *cincticornis*, n. sp., 198.
" concinnus, 198.
Aradus Falleni, 200.
" gracilicornis, 200.
" *Heidemanni*, n. sp., 200.
" Hubbardi, 198.
" niger, 200.
Aspidiotus oxycoccus, n. sp. (fig.), 73.
" perniciosus, (fig.), 292.
Aspidiotus pseudospinosus, n. sp. (fig.), 75.
Athysanus parallelus, 410.
" striatulus, 410.
" vaccini, 410.
Argia, Ontario species, 107.
ASHMEAD, W. H., article by, 294.
Augochlora fervida, 162.
Austrian Pine, Retinia attacking, 362.
Autographa Sackeni, 45.
" Snowi, 45.
Azelina ancetaria, 265.

Banasa dimidiata, 406.
BANKS, NATHAN, articles by, 221, 335.
Barathra curialis, life-history (plate), 381.
Barathra occidentata, 381.
BARNES, WILLIAM, article by, 62.
Bean Weevil (fig.), 365.
Bed-bugs, 66.
Bees from Washington State, 277.
" new Rocky Mountain, 160.
" new species, 282.
Bees of Oregon, Washington and British Columbia, 297.
Beetles of early May (figs.), 156.
Belostoma fluminea, life-history, 189.
Bembecia marginata, 266.
BERGROTH, E., article by, 198.
BETHUNE, C. J. S., articles by, 64, 156, 180, 213, 238, 287, 353.
BLACKMORE, ELSIE, articles by, 127, 210.
BLATCHLEY, W. S., article by, 267.
Blepharipus Columbiæ, n. sp., 380.
Bombus iridis *phaceliæ*, n. var., 160.
Bombycia Tearlii, 51.
Book Notices, 24, 64, 148, 180, 286, 352, 415.
Boulder Reveries: Blatchley, 352.
Boyeria vinosa, 149.
Brachyrrhinus = Mezira, 202.
BRADLEY, J. CHESTER, articles by, 356, 377.
Brephos infans, 265.

Bruchus obtectus (fig.). 365.
BUENO, J. R. de la T., articles by, 189, 242.
Buffalo Carpet-beetle (figs.), 67.
Bulletin of the B. C. Entomological Society, 180.
BUSCK, AUGUST, articles by, 121, 211, 212, 345.
Butterflies of the West Coast of the United States: Wright, 64.
Byrsopolis Chihuahuæ, 21.
" lanigera, 21.
Bythoscopus fenestratus, 410.
" pruni, 410.

Calocalpe (Hydria) undulata, 91.
Colopteryx æquabilis, 106.
" maculata, 106.
Calosoma calidum, 158 (fig.).
Campometra paresa, n. sp., 236.
" *protea*, n. sp., 234.
Canthon vigilans, 146.
Capnini, table of genera, 224.
Carab, a rare, 267.
Carpenter Bees from Africa, 364.
Carpet-beetles (figs.), 67.
Caterpillar hunting in June, 186.
Cathedra = Pristiopsis, 155.
Catocala briseis, 50, 220.
" cratægi, 220.
" præclara, 220.
" relicta, 50, 220.
" unijuga, 50.
" var. Fletcheri, 50.
CAUDELL, A. N., articles by, 136, 204.
Celithemis elisa, 152.
" eponina, 152.
Ceratina nannula, 165.
" Neomexicana, 165.
Ceresa brevicornis, 408.
Cerma marina, n. sp., 226.
Chætopsylla setosus, n. sp. (fig), 321.
CHAGNON, G., articles by, 8, 59.
Cheese-mites (fig.), 69.
Chionaspis furfurus (fig.), 291.
Chionea valga, 275.
Chromagrion conditum, 107.
Cicadula lepida, 411.
" sex-notata, 411.
Cicindela flavopunctata, 147.
" modesta, burrows of, 120.
" pimeriana, 147.
" pulchra, 147.
" rugifrons, burrows of, 120.
" scutellaris, 147.
Cicindelas of early May, 156 (figs.).
Cicindeliden, Systematischer Index der: W. Horn, 24.
Cinglis ancellata, 256.
" fuscata, 402.
Cixius colœpium, 408.
" pini, 408.
" stigmatus, 408.
" table of species, 408.
CLARKE, W. T., article by, 351.
Clastophora obtusa, 409.
" proteus, 409.
Cleora indicataria, 179.
" umbrosaria, 178, 403.
Clerus bimaculatus, 21.
Clothes-moths (fig.), 68.
Coccidæ, new species, 329.
Coccid genus Eulecanium, 83.
Coccus, type of the genus, 125.
Cœlestethus alternatus, 146.
Cœnocalpe mgnoliata, 254.
" polygrammata, 254.
" topazata, 254.
COCKERELL, T. D. A., articles by, 83, 160, 209, 277, 364.
Coleoptera, collecting notes on, 145.
Coleoptera, new, from the South-west, 113.
Coleoptera not hitherto recorded as taken in Canada, 96.
Colletes brachycerus, n. nom., 44.
" brevicornis, 44, 166.
" *clypeonitens*, n. sp., 39.
" *ochraceus*, n. sp., 42.
" *petalostemonis*, n. sp., 40.
" *pulcher*, n. sp., 43.
" *rufithorax*, n. sp., 42.
Colletes salicicola, subsp. *geranii*, nov., 163.
Colletes solidaginis, n. sp., 40.
" *Tucsonensis*, n. sp., 163.
Coloborrhynchus = Coloborrhinus, 202.
COMSTOCK, J. H., article by, 355.
Conotrachelus Arizonicus, n. sp., 340.
" *ecarinatus*, n. sp., 340.
" table of species, 341.
" *Texanus*, n. sp., 342.
Conotrachelus tuberculicollis, n. sp., 339.
COOK, J. H., articles by, 141, 181, 214, (plates).
COQUILLETT, D. W., article by, 60.
Cordulegaster, Ontario species, 149.
Cordulia Shurtleffi, 151.
Cordulinæ, Ontario species, 149.
Coriscus inscriptus, 407.
" vicarius, 407.
Corixa Florissantella, n. sp., 209.

Correction: Psinidia sulcifrons to P. fenestralis, 204.
COSENS, A., article by, 362.
Cossus Centerensis, 266.
" populi, 266.
Cotalpa lanigera (fig.), 159.
CRAWFORD, J. C., articles by, 4, 282, 297.
Crepidodera longula, 145.
Crocisa atra = *Frieseana*, n. nom., 166.
CROSBY, C. R., article by, 308.
Cryptine genus, new, from Cuba, 294.
Cryptorhynchus lacteicollis, 343.
Ctenopsyllus hamifer, n. sp. (fig.), 324.
" *selenis*, n. sp. (fig.), 322.
Culex Curriei, 28, 129.
" fatigans, 167.
" *Frickii*, n. sp., 132.
" *Hassardii*, n. sp. (figs.), 167.
" secutor, 167.
" squamiger, 129, 132.
" *sylvicola*, n. sp., 129.
Culicidæ from the West Indies, 60, 311.
Culicidæ, the Classification of, 384.
Cyathissa ochracea, n. sp., 225.
" *quadrate*, n. sp., 225.
Cydia grindeliana, n. sp., 211.
Cymatodera decipiens, n. sp., 114.
" *delicatula*, n. sp., 113.
" puncticollis, 113.
" tricolor, 21.
" *umbrina*, n. sp., 114.

Dargida procinctus, 218.
Dasiapis ochracea, 281.
DAVIS, M. W., article by, 285.
DAVIS, W. T., article by, 120.
Debis portlandia, 218.
Deilinia borealis, 258.
" *Bryantaria*, n. sp., 402.
" erythremaria, 258, 402.
" pacificaria 402.
" variolaria, 258.
Delphacissa, new subg. of Delphacodes, 155.
Delphacodes Annæ, n. nom., 156
" *Kahavalu*, n. nom., 156.
" *Melichari*, n. nom., 156.
" *sinhalanus*, n. nom., 156.
" *tabrobanensis*, n. nom., 156.
Delphas concinna = Delphacodes *Annæ*, n. nom., 156.
Delphax furcata, 408.
Delphax venosus = *D. Kahavalu*, n. nom., 156.
Dendromyia ? n. sp., 173.
Dewar, W. R., appointment of, 63.
Diastictis, discussion of the genus, 111.
" brunneata, 260.
" denticulodes, 260.
" flavicaria, 259.
" *Hulstiaria*, n. nom., 112, 260.
" loricaria, 261.
" subalbaria, 260.
" sulphurea, 259.
Dichelonycha testaceipennis, 146.
Didymops transversa, 150.
Diedrocephala coccinea, 409.
Dietzia Martinella, n. nom., 348.
Diptera, additional Minnesota, 210.
DOD, F. H. WOLLEY, articles by, 45, 89, 253.
Dolerus Cookei, n. sp., 351,
" table of species, 352.
Dorocordulia libera, 151.
Dræculacephala Manitobiana, 409.
" Novæboracensis, 409.
Dragon-flies and Damsel-flies, 29.
Drasteria conspicua, 46.
" crassiuscula, 47.
" distincta, 47.
" erechtea, 46.
Dromogomphus spinosus, 109.
Drosophila sigmoides, 44.
DYAR, H. G., article by, 110.
Dyscia orciferata, 263.
Dytiscus Harrisii, 158 (fig.).

EHRHORN, E. M., article by, 329.
Embaphion contractum, 146.
Emphoropsis cineraria, 277.
Empoasca atrolabis, 411.
" mali, 411,
" unicolor, 411.
Enallagma, Ontario species, 107.
Ennomos magnarius, 264.
Entomological meetings at Baton Rouge, La., 361.
Entomological Society of America, organization, 356.
Entomological Society of America, proposed Constitution, 357.
Entomological Society of Ontario, Annual Meeting, 353.
Entomological Society of Ontario, British Columbia Branch, 126, 180, 288.
Entomological Society of Ontario, Guelph Branch, 7, 72, 128.
Entomological Society of Ontario, Quebec Branch, 376.

Entomological Society of Ontario, regular meetings, 359.
Entomological Society of Ontario, removal to Guelph, 213.
Entomological Society of Ontario, Toronto Branch, 127, 210.
Entomological Society, Proceedings of the Hawaiian, 148.
Entomologists' Union, a North American, 1.
Entomology, Biological and Economic: Folsom, 286.
Entomology, Explanation of Terms used: Smith, 287.
Entomology of the Selkirk Mountains, B. C., 377.
Entomology, Practical and Popular, 29, 65, 137, 156, 186, 239, 289, 349, 365.
Entomology, To all interested—proposed new Society, 355.
Enypia Packardata, n. sp., 403.
Eois anticaria, 111.
" Hanhami, 257.
" inductata, 256, 402.
" persimilis, 256.
Epelis Faxonii, 258.
" truncataria, 258.
Epeolus interruptus, 166.
Epermenia imperialella, n. sp., 124.
Epiæschna heros, 149.
Epicnaptera Americana, 54.
Epicnaptera Americana, var. ferruginea, 54.
Epicordulia princeps, 150.
Epimecis virginiaria, 179.
Epizeuxis Americalis, 50.
Erastria panatela, 46.
Eriococcus bahiæ, n. sp., 330.
" *Catalinæ*, n. sp., 332.
" *Howardi*, n. sp., 331.
Erebus odora, 50.
Errata, 135.
Estola picta, n. nom., 21.
Eucestia fuscata, n. sp., 275.
Euchlæna astylusaria, 265.
" Johnsonaria, 265.
" obtusaria, 264.
" pectinaria, 264.
Euchœca albovittata, 91, 414.
Euchœca comptaria, a further note on, 203.
Euchœca comptaria muddle, note on, 110.
Euchœca comptaria, what it really is, 33.
Euchœca, condensata, 110, 204.
Euchœca cretaceata, 91.
Euchœca exhumata, n. sp., 36, 110, 204.
Euchœca lucata, 204.
" *Pearsalli*, n. nom., 110, 204.
" perlineata, 33, 101, 203.
" salienta, 33, 101, 204.
" unipecta, 35, 110.
Euclidia annexa, 49.
" cuspidea, 49.
Eucrostis viridipennata, 257.
Eucymatoge, anticaria 90, 101.
" intestinata, 91.
" *Vancouveratu*, n. sp., 397.
" vitalbata, 91.
Eufidonia notataria, 258.
Eulecanium, table of species, 83.
" the Coccid genus, 83.
Eulema = Eulæma, 166.
Eumelicharia, n. nom. = Walkeria, Mel., 156.
Euperia fulvago, 218.
Eupithecia adornata, n. sp., 104.
" *Alberta*, n. sp., 103.
" borealis, 89, 101.
" *Bryanti*, n. sp., 392.
" casloata, 89, 102.
" castigata, 90, 102.
" cretaceata, 101.
" *Dodata*, n. sp., 103.
" *Dyarata*, n. sp., 101, 390.
" *Hanhami*, n. sp., 391.
" *Harveyata*, n. sp., 390.
" *insignificata*, n. sp., 394.
" lariciata, 395.
" *modesta*, n. sp., 393.
" multiscripta, 101.
" multistrigata, 90, 104, 391.
" nimbicolor, 90, 101.
" *obumbrata*, n. sp., 393.
" *olivacea*, n. sp., 389.
" *perbrunneata*, n. sp., 395.
" ravocostaliata, 90, 101.
" *Regina*, n. sp., 89, 102.
Eupithecia, species occurring at Calgary, 101.
Eupithecia sublineata, n. var.? 395.
" *Youngata*, n. sp., 404.
Euselasia Howlandi, n. sp., 79.
Eutrapela alciphearia, 265.
Eutricha Oweni, n. sp., 62.
Eustroma destinata, 91.
" nubilata, 92.
" *Harveyata*, n. sp., 398.
" Packardata, 91.
" populata, 91, 399.
" propulsata, 91.

Eustroma testata, 91.
Euvanessa antiopa, pupation of, 411.
Euxoa esta, n. sp., 227.
EVANS, J. D., article by, 96.
Experimental Farms, Report of, 180.

FALL, H. C., article by, 113.
FERNALD, MRS. M. E., article by, 125.
Fleas (fig.), 66.
" Three new Canadian (figs.), 321.
FLETCHER, JAMES, articles by, 381, 411.
Flour mites and beetles, 69.
Fruva fasciatella, 46.
FYLES, THOMAS W., article by, 137.

Gelechia fondella, n. sp., 122
Geometrid moth, a European in Canada, 220.
Geometrid moths from Alberta, new, 205.
Geometrid moths, new N. American, 272.
Geometrid moths taken at Temagami Lake, 94.
Geometridæ, new, from British Columbia, 389.
Geometridæ, notes on, 414,
GIBSON, A., articles by, 186, 365, 381.
GIRAULT, A. A., article by, 81.
Gli Insetti: Berlese, 415.
Gluphisia Lintneri, 52.
" septentrionalis, 52.
Gnathodus viridis, 411.
Gomphus, Ontario species, 109.
Gonatopus cyphonotus, n. sp., 380.
GRABHAM, M., articles by, 167, 311.
Grabhamia de Neidmannii, 132.
Greeleyella Beardsleyi, 164.
GROSSBECK, J. A., articles by, 129, 272, 285.
Gryllus campestris, 207.
" tegminal position in, 207.
Gynæphora Rossii, 52.
Gypona flavilineata, 409.
" Quebecensis, 409.
Gypsochroa designata, 254.

Habrosyne scripta, 51.
Hadena bultata, n. sp., 228.
HAIGHT, D. H., article by, 94.
Hagenius brevistylus, 108.
Halictus atriventris, n. sp., 298, 300, 303.
Halictus Birkmanni, n. sp., 5.
Halictus Cooleyi, n. sp., 298, 299, 301.
" *Cordleyi*, n. sp., 298, 299, 302.
" *Fedorensis*, n. sp., 4.
" *lineatulus*, n. sp., 5.
" nigricornis, 166.
" *Pecosensis*, n. sp., 6, 63.
" Provancheri, 303.
" *pruinosiformis*, n. sp., 284.
" *Robertsoni*, n. sp., 4.
" synopsis of species, 297.
" testaceus, 166,
" trizonatus, 303.
" *Vachali*, n. sp., 297, 300.
Halipus squamosus, 145.
Halisidota caryæ (fig.), 188.
" maculata (fig.), 188.
Haltica rufa at Mt. St. Hilaire, P.Q., 8.
Harpalus caliginosus, 158 (fig.).
Harpyia albicoma, 52,
" modesta, 51.
" scolopendrina, 51.
Hawaiian Entomological Society, 148.
HEATH, E. F., article by, 218.
Helocordulia Uhleri, 151.
Hemiptera, aquatic, life-histories of, 189, 242.
Hemiptera, notes on American, 198.
Hemiptera, Pagiopodous, corrections to list of genera, 372.
Hemiptera taken near Lake Temagami, 406.
Hemipterous superfamily miroidea, Classification, 369.
Hepialus hyperboreus, 267.
Himella flosca, n. sp., 231.
Himera pennaria, occurrence in Manitoba, 220.
Histagonia Marxi, n. sp., (figs.), 309.
Homoptera lunata, 220.
" new, from Africa, 154.
Homopyralis edilis, n. sp., 237.
House-flies, 65.
Household Insects, 65.
HOWARD, L. O., article by, 415.
Howardina aureostriata, n. sp., 171.
" Walkeri, 170.
Hyaloscotes fragmentella, 265.
Hydnocera affiliata, n. sp., 117.
" *cribripennis*, n. sp., 116.
" *cyanitincta*, n. sp., 116.
" *plagifera*, n. sp., 115.
" *sobrina*, n. sp., 117.
Hydriomena autumnalis, 253, 400.
Hydriomena autumnalis Columbiata, n. var., 399.
Hydriomena custodiata, 253.
" *manzanita*, n. sp., 400.

Hydriomena multiferata, 253.
" nubilifasciata, 253.
" quinquefasciata, 253.
" ruberata, 253, 400.
" sordidata, 253.
" trifasciata, 253, 400.
Hymenoptera, new Aculeate, 379.
Hypena humuli, 50.
" " var. albopunctata, 51.
Hyperæschra stragula, 51.
Hyperitis amicaria, 264.
" notataria, 264.
" triangulifera ta, 264.

Idiocerus Provancheri, 410.
" suturalis, var. lunaris, 410.
Incisalia Augustus, 214 (plate).
" Henrici, 141, 181.
" irus, 141 (plate), 181.
Incisalia irus, Hymenopterous parasite, 181.
Incisalia, Studies in the genus, 141, 181.
Incurvaria rheumapterella = Prodoxus Coloradensis, 348.
Ischnura, Ontario species, 108.
Isia Isabella (figs.), 137.
Isoperla longiseta, n. sp., 337.
" *sordida*, n. sp., 337.
Ithomia Drogheda, n. sp., 78.

Janthinosoma echinata, n. sp. (fig.), 311.
JARVIS, T. D., articles by, 7, 128, 239, 289, 349.
JONES, D. H., article by, 352.

Kermes Rattani, n. sp., 329.
KING, G. B., article by, 325.
KIRKALDY, G. W., articles by, 9, 135, 154, 202, 369.
KNAUS, W., article by, 145.

Lachnosterna alpina, 148.
Ladona Julia, 153.
Lanthus albistylus, 108.
Larder-beetles, 68.
Lasiocampid, new, from Arizona, 62.
Lepidoptera, new South American, 76, 174.
Lepidoptera of Alberta, list of, 45, 89, 253.
Lepidoptera taken at Temagami Lake, 94.
Lepidoptera taken in Manitoba (1905), 218.
Leptomeris quinquelinearia, 256.
" sentinaria, 256.
" *subfuscata*, n. sp., 402.
Lepyronia quadrangularia, 409.
Lestes, Ontario species, 106.
Leucorhinia, Ontario species, 152.
Leuctra grandis, n. sp., 338.
Libellula, Ontario species, 153.
Libellulidæ, Ontario species, 150.
Liburnia frontalis = Delphacodes sinhalanus, n. nom., 156.
Liburnia fumipennis = D. Melichari, n. nom., 156.
Liburnia pallidula = D. taprobanensis, n. nom., 156.
Ligyrocoris contractus, 406.
Lobophora halterata, 118.
" inequaliata, 70, 118.
" montanata, 70, 118.
" nivigerata, 70, 118.
LOCHHEAD, W., article by, 65.
Locust Mite (figs.), 349.
LUDLOW, C. S., articles by, 132, 185, 296, 326, 367.
LUTZ, F. E., article by, 207.
Lycia cognataria, 263.
Lygus, Lake Temagami species, 407.
LYMAN, H. H., article by, 1, 140.
Lypsimena tigrina, 20.
Lythrodes minutissima, n. sp., 234.

MACGILLIVRAY, A. D., article by, 305.
Macrolophus separatus, 407.
Macromia Illinoiensis, 150.
Malacosoma Americana, 53.
" disstria, 54.
" fragilis, 53.
Mamestra sareta, n. sp., 229.
" *tuana*, n. sp., 229.
Meal-worms, 69.
Megachile pruinosa, 166.
Melalopha albosigma, 51.
" apicalis, 51.
" Brucei, 51.
MELANDER, A. L., article by, 286.
Melanoconion Urichii, 61.
Melipotis limbolaris, 49.
Mesene Rochesteri, n. sp., 77.
Mesoleuca albolineata, 94.
" cæsiata, 93.
" gratulata, 93.
" hersiliata, 94.
" intermediata, 64.
" lacustrata, 93.

Mesoleuca silaceata, 94.
" truncata, 94.
" vasaliata, 94.
Mesothemis simplicicollis, 153.
Mesotrichia mixta, 364.
Mesquite, Coleoptera bred from, 145.
Metanema determinata, 265.
" inatomaria, 265.
Metrocampa perlata, 264.
Mezira Jamaicensis, n. sp., 201.
Micrathyria berenice, 153.
Miris affinis, 407.
Miroidea, Classification and nomenclature of the Hemipterous superfamily, 369.
Mites affecting Farm homesteads, 239.
Mochlostyrax Jamaicensis, n. sp. (fig.), 318.
Mompha Engelella, n. sp., 123.
" *stellella*, n. sp., 123.
Monolocoris filicis, 407.
MORRILL, A. W., article by, 361.
Mosquito, an Alaskan, 326.
Mosquitoes, 66.
Mosquitoes, notes and descriptions, 27, 60, 129, 132, 167, 185, 296, 311, 326, 367.
Mosquitoes, the Classification of, 384.
Mytilaspis pomorum, 289 (figs.).

Nannothemis bella, 152.
Nehalennia irene, 107.
Nemourini, table of genera, 224.
Neolexia speciosa, 92.
" xylina, 92.
Neopasites Robertsoni, n. sp., 283.
Nesolinoceras, n. gen., 294.
" *espini*, n. sp., 295.
Neurocordulia Yamaskanensis, 150.
Noctuidæ, new species for 1906, 225.
Noctuid Moths taken at Temagami Lake, 94.
Nomada Jennei, n. sp., 281.
" *ornithica*, n. sp., 161.
Nomada superba = *chrysopyga Pereziana*, n. nom., 166.
Nomenia 12-lineata, 33, 110, 203.
" *unipecta*, n. sp., 35, 110, 204.
" " var. secunda, 37, 110.
Nomia Melandri, n. sp, 279.
Notodonta simplaria, 51.
Notolophus antiqua, 53.
Nymphidium Blakei, n. sp., 78.

Ochodæus estriatus, n. sp., 271.
Ochodæus inarmatus, n. sp., 270.
" *planifrons*, n. sp., 269.
" *præsidii*, n. sp., 270.
Odonata, Classification into families (figs), 29.
Odonata, list of Ontario species, 105, 149.
Olene plagiata, 53.
Oncideres cornuticeps, n. sp., 20.
" table of species, 18.
Oliarus Bouakeanus, n. sp., 155.
Ophiogomphus rupinsulensis, 108.
O'Reillia, Ludlow = Etorleptiomyia, Theobald, 185.
Ormenia marginata = *epilepsis*, n. nom., 156.
Orthezia Californica, n. sp., 329.
Orthodea gigas, n. sp., 230.
Orthofidonia semiclarata, 258.
Orthoptera from Canadian Northwest, 55.
Orthosia discolor, 218.
" paleacea, 218.
" punctirena, 218.
Orthotylus chlorionis, 408.
Osmia hypocritica, n. sp., 160.
" Neomexicana, 161.
Osten Sacken, death of Baron, 238.
Otiocerus Coquerberti, 408.
Oyster-shell Bark-louse (figs.), 289.

Pachydiplax longipennis, 153.
Pamphila Bryanti, n. sp., 175.
" *Chinoba*, n. sp., 175.
Paraphia subatomaria, 262.
PEARSALL, R. F., articles by, 33, 71, 118, 178, 414.
Perdita Cockerelli, n. sp., 282.
Peridromia saucia, 218.
Perla luctuosa, n. sp., 336.
Perlidæ, new species, 335 (figs.).
" notes on classification, 221.
" table of tribes, 222.
Perlini, table of genera, 223.
Perlomyia, n. g., 338.
" *collaris*, n. sp., 338.
Phenacoccus Colemani, n. sp., 332.
Pheosia dimidiata, 51.
Pherne jubararia, 265.
Philobia enotata, 259.
Philometra goasalis, 50.
Philopsia canavestita, n. sp., 118, 414.
" nivigerata, 71, 120, 414.
Phytocoris eximus, 407.
" pallidicornis, 407.
Pine-needle moth, a new injurious, 212.

Plagiognathus, Lake Temagami species, 408.
Platæa trilinearia, 262.
Plathemis Lydia, 154.
Platymetopius acutus, 410.
Platynus quadrimaculatus, 267.
Plemyria Georgii, 93.
" hastata, 93.
" luctuata, 93.
" sociata, 93.
" subrosuffusata, 93.
" tristata, 93.
Plestia Kikkawai, n. sp., 177.
Podisus serieventris, 406.
Pœcilocapsus lineatus, 407.
Polia confragosa, 219.
Polycesta, angulosa, 23.
" *Arizonica*, n. sp., 21.
" Californica, 22.
" elata, 22.
" velasco, 23.
" table of species, 23.
Practical and Popular Entomology, 29, 65, 137, 156, 186, 239, 289, 349, 365.
Prionoxystus robiniæ, 266.
Priophorus acericaulis, n. sp., 305, 306.
" æqualis, 305, 306.
" simplicicornis, 305.
" solitaris, 305, 307.
Priophorus, table of American species, 305.
Progona = *Mea*, n. nom., 348.
Prosopis frontalis = *Fedtschenkoi*, n. nom., 165.
Prosopis Morawitzi = *Pereziana*, n. nom., 165.
Pseudoparasitism by Dipterous larvæ, 413.
Pseudococcus juniperi, n. sp., 333.
Pseudothyatira cymatophoroides, var. expultrix, 51.
Psinidia fenestralis and sulcifrons, 204.
Psylla carpini, 411.
Pteronarcini, table of genera, 223.
Publication of descriptions of new species—a protest, 140.
Pulvinaria, larvæ of some species, 325,
" amygdali, 326.
" Cockerelli, 325.
" Ehrhorni, 326.
" *occidentalis*, 325.
" *plucheæ*, n. sp., 334.
" Tinsleyi, 325.
" viburni, 326.

QUAYLE, H. J., article by, 27.

Rachela Bruceata, 89.
Ranatra quadridentata, life-history, 242.
Reabotis immaculalis, 46.
Recurvaria pinella, n. sp., 212.
Renia Hutsoni, n. sp., 237.
Retinia Austriana, n. sp., 362.
Rheumaptera (Plemyria) hastata, 93.
Rhinocapsus Vanduzei, 407.
Rhyncophora, new species, 339.
RILEY, W. A., article by, 413.
Ripersia Kelloggi, n. sp., 334.
Roach, new, from the Philippines, 136.
ROTHSCHILD, N. C., article by, 321.

Sabulodes lorata, 265.
Salganea humeralis, n. sp., 136.
San Jose scale (figs.), 292.
Sarcophaga carnaria, 413.
Saunders, Dr. Wm., made a C. M. G., 3.
Saw-fly, new species, 351.
Scale-insects, new (figs.), 373.
Scaphoideus Annæ, n. sp., 154.
" immixtus, 410.
SCHAEFFER, CHAS., articles by, 18, 269, 339.
Sciagraphia continuata, 259.
" denticulata, 259.
" granitata, 258.
" mellistrigata, 259.
Scurfy Bark-louse (fig.), 291.
Selenia alciphearia, 265.
Selidosema umbrosarium, 178, 263.
Setagrotis dolens, n. sp., 226.
Setomorpha, notes on, 347.
SHERMAN, FRANKLIN, article by, 29.
Sicya crocearia, 263.
" macularia, 263.
SMITH, JOHN B., article by, 225.
Snow fly (Chionea valga), 275.
Somatochlora elongata, 151.
" forcipata, 151.
Somatolophia Haydenata, 179.
Sphecodes Columbiæ, n. sp., 280.
" *eusticlus*, n. sp., 162.
" gracilior, 166.
" Pecosensis, 165.
" Sophiæ, 165.
Sphinx luscitiosa, 59.
Spilomena alboclypeata, n. sp., 380.
Spined Rustic, life-history (plate), 381.
Spittle insects, Guests of, 44.
Spodolepis substriataria, 262.
Spragueia tortricina, 46.
Stegomyia Busckii, n. sp., 60.
" fasciata, 167.
" *mediovittata*, n. sp., 60.

Stenaspilates flavisaria, n. sp., 272.
" *Smithii*, n. sp., 273.
Sthenopis argenteomaculatus, 266.
" quadriguttatus, 267.
SWENK, MYRON H., article by, 39.
Sympetrum, Ontario species, 152.
Sympherta Julia, 261.
Synchlora glaucaria, 257.
Syneda Athabasca, 49.
" Hudsonica, 50.
Synelys enucleata 255.
Syngrapha devergens, 45.
" ignea, 46.
Synonym in Culicidæ, 185.
Tæniorhynchus Sierrensis, 132.
Tæniorhynchus squamiger, notes on, 27, 132.
Tæniorhynchus palliatus, n. sp., 61.

Talledega inequaliata, 70, 118.
" montanata, 71, 89, 118.
Talledega montanata, var. magnoliatoidata, 71, 120.
Talledega nivigerata, 70, 118, 415.
" tabulata, 119.
TAYLOR, G. W., articles by, 101, 111, 203, 205, 220, 389.
Tephroclystis (Eupithecia) Regina, 89.
Tetragoneuria, Ontario species, 151.
Tetralonia Douglassiana, n. sp., 278.
" *Yakimensis*, n. sp., 278.
Thamnotettix eburata, 410.
" inornata, 410.
" Smithii, 410.
" subcupreus, 410.
" waldana, 410.
Theobaldia Alaskaensis, n. sp, 326.
Theonœ stridula, n. sp., (figs.), 308.
Therasea angustipennis, 46
Theridiidæ, new species, 308.
Tinea aflictella, 348.
" Martinella, 348.
Tineidæ, Dr. Dietz's revision, 345.
Tineina, new American, 121.
Tortricid, new, from Texas, 211.
Toxorhynchites argenteotarsis, n. sp., 367.
Tramea Carolina, 154.
Trichodezia albovittata, 414.
" Californiata, 414.
Trichogramma pretiosa, colour variation in the adult, 81.
Trichogramma pretiosa, var. *nigra*, n. var., 82.
Trichotaphe trinotella, n. sp., 122.
Trichotaphe Washingtoniella, n. sp., 121.
Triphosa indubitata, 254.
Trombidium locustarum (figs.), 349.
Typhlocyba tenerrima, 411.
Tyroglyphus longior, 240.

VAN DUZEE, E. P., article by, 406.
Verrallina insolita, n. sp., 62.
VIERECK, H. L., article by, 297.

WALKER, E. M., articles by, 55, 105, 149.
Walkeria, Mel. = *Eumelicharia*, n. nom., 156.
Wasps' Nest, singular locality for, 285.
Water-bug, a Fossil, 209.
Water-bugs, life-histories of, 189, 242.
WEEKS, A. G., articles by, 76, 174.
WICKHAM, H. F., article by, 24.
WILLISTON, S. W., article by, 384.
Wing-vein Nomenclature, 285.
Winter Retreats of Insects, 137.
WOGLUM, R. S., article by, 73.
Work for June—Caterpillar hunting, 186.

Xanthorhöe abrasaria, 254.
Xanthorhoe circumvallaria, n. sp., 205, 255.
Xanthorhöe ferrugata, 255.
" fossaria, 255.
" fluctuata, 401.
" incursata, 254.
" munitata, 254, 401.
" *pontiaria*, n. sp., 400.
" *possaria*, n. sp., 401.
Xanthotype crocataria, 264.
Xylina capax, 219.
Xylocopa tarsata, var. *Wellmani*, n. var., 364.

Zenophleps lignicolorata, 93, 399.
" *Victoria*, n. sp., 399.